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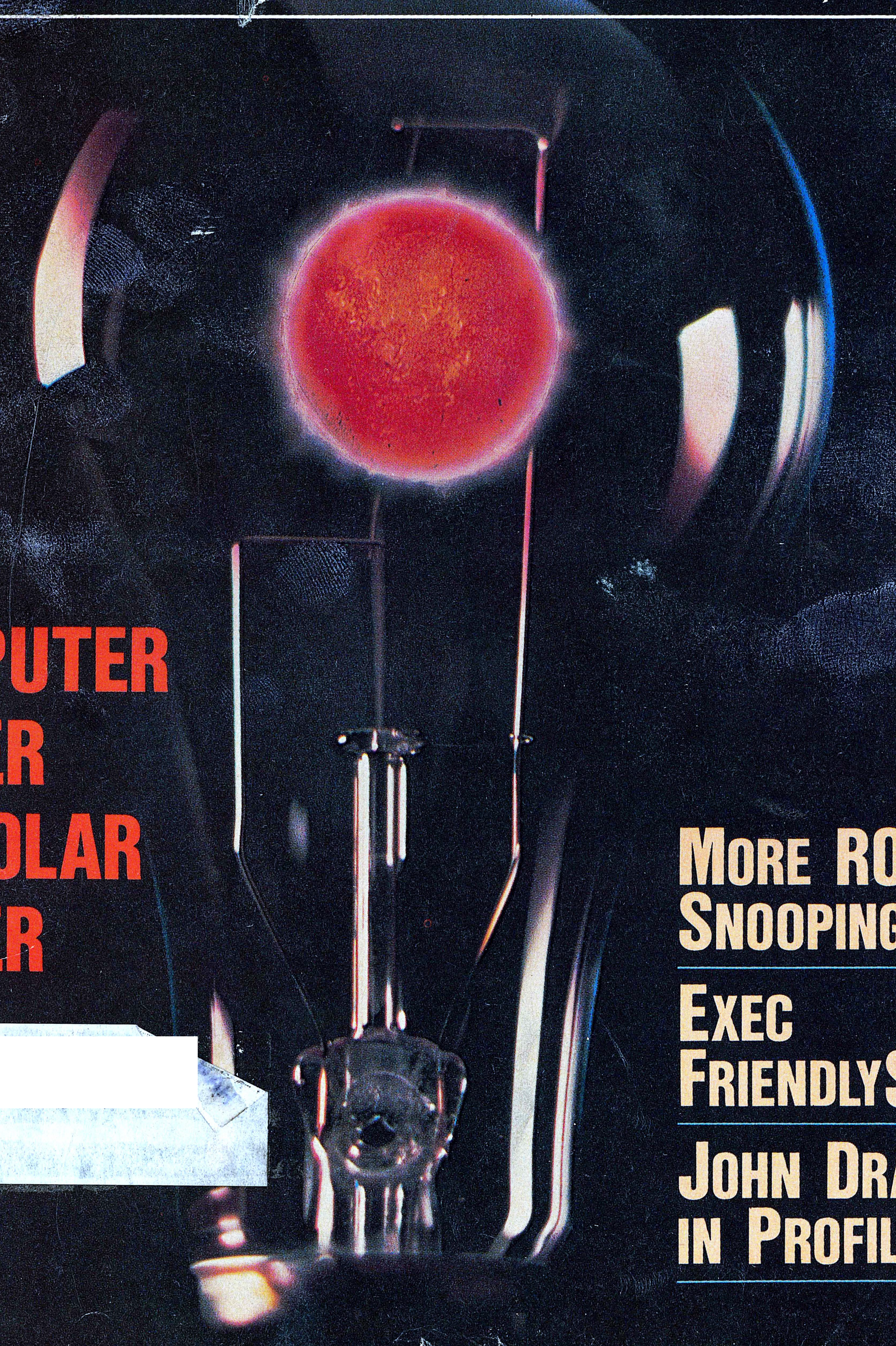
softalk

for the IBM Personal Computer



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Chance is alive and there's a contest afoot! Here's a chance for all you oracles, swamis, and mental prestidigitators to win $100 worth of stuff for your computer. All the contest requires is that you give it your best guess.

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Insiders at Apple *Softalk* have told us that IBM people (you know who you are) don't enter contests. Can you believe it? Ridiculous!

Now's your big chance to prove them wrong and show the competition you're as fun loving and clever as the next user. All you have to do is predict who the top five winners will be in our first annual Most Popular Software Poll. While you're busy listing your own favorites, take a moment to try and figure out how everybody else will be voting. The person with the most accurate prediction will win $100 worth of goods for his pc.

Whether you're shooting off the top of your head, playing a hunch, or have it straight from the horse's mouth, give us your best shot. Fill out the form on this page, or a facsimile, with the names of the software packages you think will turn up as the top five on the list. They must be in the correct order to win. You can enter as many times as you wish, but all entries must be on separate pieces of paper.

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Only one winner will be chosen. In case of a tie, our random number generator will be called upon to decide.

Deadline for mailing your entry is February 15, 1983. The winner will be announced in the March issue. But don't wait till then to see if you've won—we'll have a brand-new contest for you to enter next month. And the next month, and the next.

Sharpen your pencils and get ready to win. Remember, your reputation is at stake.

Mail your entry to: I Predict, *Softalk* IBM, 11160 McCormick Street, Box 60, North Hollywood, CA 91603. ▲

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crosstalk

Review Trap

We were very pleased with your review of *Space Guardian* in the September issue of *Softalk for the IBM*. Your comment about disabling the keyboard buffer is well taken. Unfortunately, that problem is a result of the hardware and systems software supplied by IBM. The delay allows the program to clear the keyboard buffer of information that IBM claims the system will not trap, but which, in reality, it does.

Mark Stuart, president, Omric,
Newington, CT

Scrolling with the Punches

I receive your magazine and find it interesting and helpful. I have been looking without success for the secret to scrolling. The manuals say the Scroll Lock key is just there to detect whether it (the key) has been depressed or not and that it is up to the programmer to supply the function. How do I do it? I would like to do it from Basic if possible. I have the macro assembler for DOS, but I'm still doing elementary things with it. I am told that scrolling is done at refresh speeds that are about sixty times faster than mere I/O via Print. I must confess, the manuals are confusing to me concerning programming the various chips and I'm never quite sure where my 128K fits into the rest of the system. Ports, interrupts, talking about addresses near one million when I have only 128K, and the 8086 books aren't getting me there fast enough. I have worked with Cobol, Fortran, Basic, Mark IV, Focus, Ramis, Image, Query, PLI, SPL, and more. Help!

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In addition, an assembler column that would show some real examples would be great. Is it too much to ask to show a sample program that reads and writes records; does some math with addition, subtraction, multiplication, and division; does a table lookup and then prints a small report; and throws in a little sort somewhere for good measure.

I'd settle for scrolling for starters and would also like to see an indexed file scheme since the pc only has sequential and random (what I call relative). Thanks, I feel better already.

Howard R. Schneider, Babylon, NY

Easy Underline

Since I wrote the letter about underlining with *EasyWriter 1.0* (November), I've discovered that this same method works with version 1.1 too. The underline feature works great when embedded directly from the keyboard, as well as with converted 1.0 files. Just be sure you use control-O (the letter "O") and not control-0 (the number zero) in the first and third embedded commands.

John E. Morse, Rochester, NY

Fan Mail for Morse

I would like to congratulate you on your excellent publication. It is always interesting, and I look forward to reading it each month. Keep up the good work!

I am writing in reference to a letter that appeared in November Crosstalk from John E. Morse concerning *EasyWriter* and an Epson equipped with Graftrax Plus. I have driven myself crazy over the question that Mr. Morse so succinctly and clearly answered. For some time I have experimented with the fonts that my Epson can produce using *EasyWriter 1.1*. I had been able to obtain every print style except those two that required a CHR$(0) to make them work properly such as underlining and superscripting. Originally, I had been entering the codes directly rather than assigning a character to the digit and then entering the appropriate user commands. This method had worked quite well with the other fonts, so naturally I applied the same technique. I asked people everywhere if they could help me, even going so far as to post a message on a telecomputing service. I was just about to give up hope when I read John Morse's letter. For a student like me who has to turn out a large number of papers each semester and has already given his all to buy a system with a less expensive dot matrix printer, this letter was quite a help!

George S. Richards, Medford, NJ

Profit Peeve

The recent Profit Plot (November) is inaccurate. It sets out to demonstrate the use of a spreadsheet for planning your life insurance. In general, the article itself does an excellent job of setting down the information and considerations required. On the other hand, the actual mathematical application of the spreadsheet to the facts given indicates the problems that arise when a little knowledge is applied to a complicated subject.

The insurance article demonstrated a lack of understanding of insurance mathematics and contractual provisions. Additionally, unless it was a typesetting error, the information in the figure setting down the cost per thousand for the term insurance alternative was grossly inaccurate since the *VisiCalc* program divided by 1,000 in determining the cost per thousand for $100,000 of coverage, instead of dividing by 100. Thus, in year one, the cost per thousand in the article is $.41 when, in fact, it should be $4.08—not a small difference! Given the correct term figures, it is questionable whether a properly informed individual would terminate the permanent insurance, even though the cost per thousand calculated for it is higher than it should be.

When considering the cost per thousand on a permanent insurance policy one must take into consideration the cost of money. This is done in the example, but it is expressed as a figure selected by the person presenting the problem, whereas the interest rate that should be used is the loan rate specified in the policy reduced by the tax bracket for the owner of the policy. The reason for this is that the money in the cash value of the policy is available to the owner at a specified interest rate of 5 percent. This means he can take the money out and pay interest on the use of the funds, rather than leaving them there. When this is done, he incurs an interest cost of 5 percent on the loan created as a result of pledging the policy to the insurance company as collateral. This is no different than pledging an asset at the bank to obtain funds for alternative investment without giving up ownership of the asset.

Additionally, a proper consideration of the net cost has to take into account the increase in value attributable to the payment of the net premium. Since this information is not available from the facts given, an accu-

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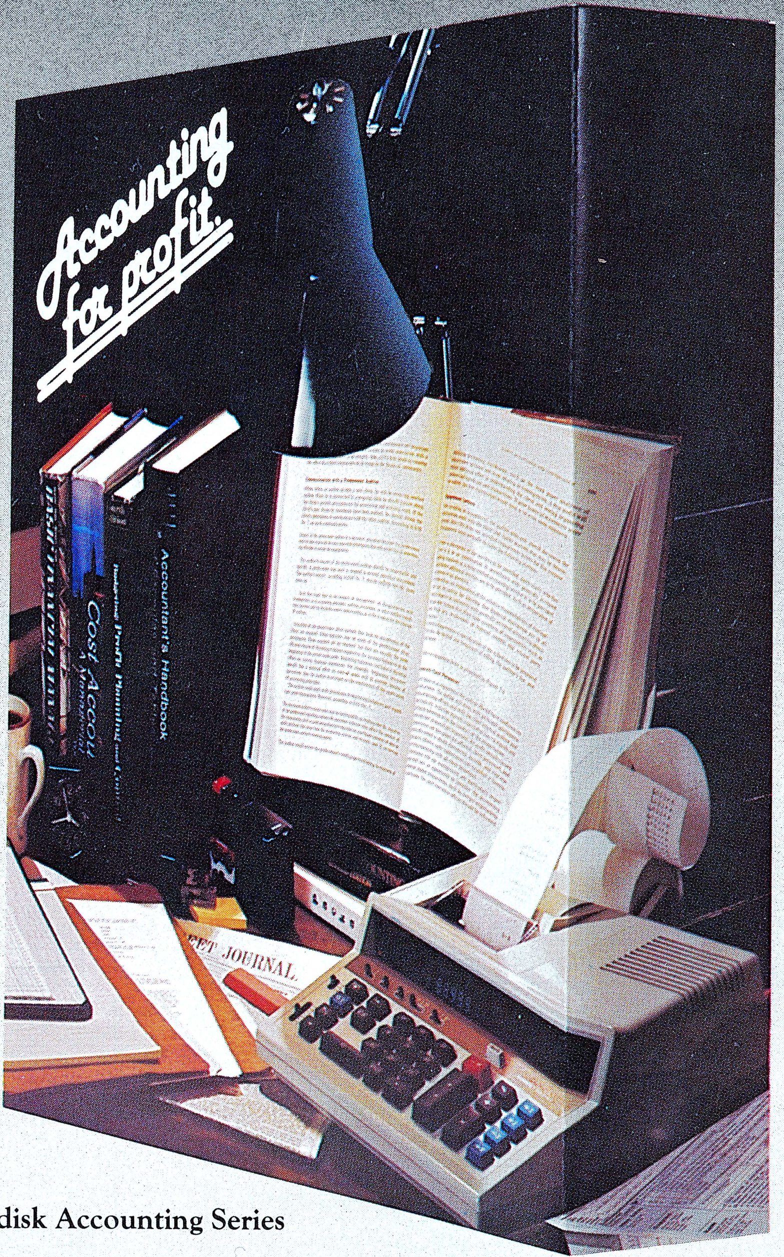

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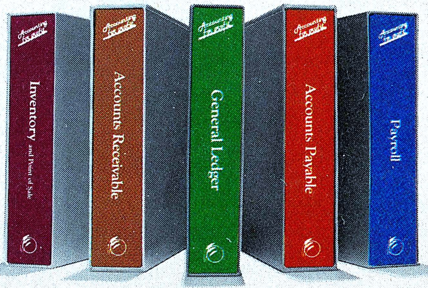

rate cost per thousand cannot be stated for the policies illustrated.

Anyone relying on the spreadsheet illustration outlined in the article as a determinant for retaining or replacing old insurance will be making a big mistake. No action should ever be taken on permanent life insurance policies without an evaluation made by a person qualified to make such evaluations.

W. Donald Jordan, Haverford, PA

The Price Is Right

We were naturally pleased to read the very favorable comments made about *Data Capture/pc* in Marketalk Reviews (November '82). We have tried to make our software as comprehensive and flexible as possible while still maintaining ease of use, and we appreciate the fact that your reviewer recognized this. We particularly appreciated the comments about the quality of the documentation, since we have always felt that any computer program is only as good as the instruction manual provided with it.

However, we must take exception to the remarks made in reference to the price of *Data Capture/pc.* We have always felt strongly that much of the software available for microcomputers is highly overpriced. We have made a concerted effort to price our software at what we think is a very reasonable level compared to competing products with similar capabilities. We also feel that the vast majority of our customers are honest people, and so we do not copy protect our software as do many of our competitors.

In his review, Burton Alperson states that *Data Capture/pc* is not a good value for the money, and that other programs of equal quality and ease of use are available for less than one-fourth the price. However, Mr. Alperson fails to give any examples of such programs.

PC magazine recently published a listing of hundreds of programs available for the IBM pc, including twenty-four communications-oriented programs. Twelve of these were priced at $100 or lower, and twelve were priced at $125 or higher (up to $650). *Data Capture/pc* at $120 is therefore priced at the median level. We feel certain that an objective comparison of features, ease of use, and price would show that it is a good value for the money.

David G. Hughes, New Orleans, LA

Cobol Complaint

I would like to get a Cobol compiler. I hesitate because it does not produce object code (machine instructions) for one thing, and the idea of having run-time executables is another drawback. Then I read the letter in Crosstalk (October) titled "Vanishing Point." This letter didn't state specifically the nature of the complaints about Cobol. Speaking for other users, it would be of greater value if the critical feedback from fellow readers was more to the point in the future.

Dave Tallis, West Springfield, VA

Plaudits from a Pro

Being a professional systems programmer I realize the importance and value of accurate and understandable computer documentation, and I have experienced the horrors of its converse. My IBM pc is nearly a year old, and I obtain data about it from many different sources. Alan Boyd's System Notebook has proved to be one of the most concise, comprehensible, and reliable sources of information I have found. As a matter of fact, I have cut and pasted his articles into the appropriate sections of my DOS and *Guide to Operations* manuals. Richard Kaapke and Craig Stinson should also be commended for their fine departments. You can add my name to your growing list of satisfied subscribers.

Michael V. Maieli, Raleigh, NC

Volkswriter Views

I purchased the *Volkswriter* word processor published by Lifetree six weeks ago and would like to let other pc owners know that it is easy to use and has enough sophistication for superscripts, subscripts, and alternating or centered headers and footers. It also has easily accessible and friendly support by phone or letter. As I have just started seeing its applications to bibliographies and presentations, I think I will be discovering new uses.

Joel Bamford, Duluth, MN

Doctor's Query

Can any fellow readers recommend software for the pc that I can use in my medical practice?

F. A. Choudhri, Eau Claire, WI

Praise for Boyd

In the October '82 Crosstalk, one of your readers commented, "Whatever you're paying Alan Boyd, it's not enough!" I wholeheartedly agree with this statement. Alan Boyd seems to have that rare ability to make difficult subject matter almost embarrassingly easy to understand. I guess it is because he talks to you, explaining concepts in simple terms, then walks you through a demonstration providing further suggestions as to how the feature can be useful—an accomplishment that virtually every other writer in the microcomputer field seems to have difficulty doing. His articles are extremely valuable to pc users since the IBM documentation format is so nonhuman oriented. Although it is much too much to ask of him, I think we would be further ahead if all IBM documentation were scrapped and rewritten by Alan Boyd.

Randolph R. Madera, Forest Park, IL ▲

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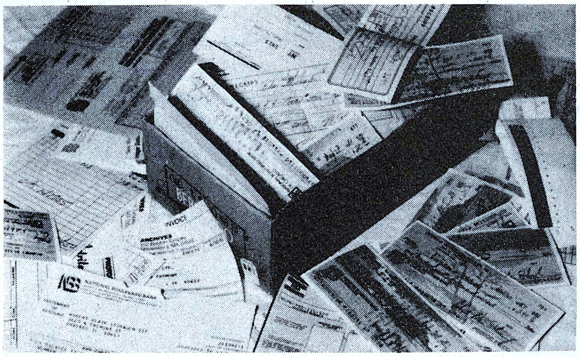

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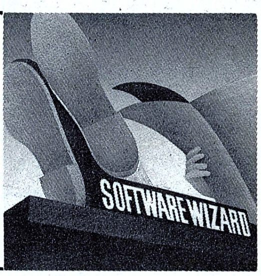

Some hard and soft advances on the international front:

Δ French and German speaking micro users can now use **Innovative Software**'s data management products in their native tongue.

Innovative is the maker of *Total Information Management (TIM III)* for the pc and CP/M-based systems.

A French company, **Publi-Soft**, has translated *TIM III* and its documentation into *System III*, a French-language version. It will be sold in France, Belgium, and the French-speaking parts of Switzerland. The German version will be called *UDO* by its translators and distributors, **Cosi-X.** They will sell the program in Germany, Austria, and the other parts of Switzerland in which German is spoken.

Innovative has also licensed distribution of its products in the United Kingdom, the Far East, Africa, and several Iron Curtain countries to **Innovative Software International, Ltd.**

"These three companies represent some of the most efficient and extensive marketing operations in the world," says **Tom DeBacco,** Innovative's director of sales.

"What's more, Publi-Soft and Cosi-X are very successful high-tech developers who are able to remake *TIM* into a truly French and German language product."

Δ IBM is expected to emerge rapidly as the leading vendor in the office sector of European microcomputer sales in the next ten years, according to a 230-page study by **International Resource Development** (IRD) of Norwalk, Connecticut.

The report states that by the end of 1982 there will be 1.7 million personal computers in European homes and offices, and this figure will rise to 18 million by the end of 1985. Some 20,000 pcs are already installed in Europe, even though the machine has not been officially introduced there by IBM.

IRD researchers heard rumors in Europe that no less than 40,000 European IBM employees (none of whom apparently can keep a secret) had already ordered their own pcs, and that has inspired dealers to order more than 150,000 of the machines for delivery as soon as they are offically released.

A new, lower-priced IBM machine is expected to be introduced worldwide to compete with the Commodore and Sinclair micros, which are doing very well in Europe. By 1983, half of IBM's expected output of one million machines will be going to countries outside the United States.

Δ The first portable microcomputer Cobol compiler to support the Japanese industry standard set of Kanji characters is being demonstrated by **Micro Focus** (Palo Alto, CA) at the Data Show in Tokyo, Japan's largest data processing trade show. Users will see Kanji characters rather than less familiar alphabetic symbols.

"The office automation market in Japan is microcomputer based, and more than 90 percent of all business applications are written in Cobol," says Micro Focus president **Paul O'Grady.**

The company's *Level II Cobol* compiler processes alphabetic, numeric, and Kanji symbols as it reads the source code. It also supports Katakana characters, the Japanese ideograms for Western words not represented by other existing Japanese symbols.

Level II Cobol is the first Kanji-supporting Cobol that can be configured for a variety of computers. It is the only micro Cobol certified at the high level by the United States government and certified with zero errors by the United States Federal Compiler Testing Center. Micro Focus recently received similar certification for its mainframe Cobol.

Back in the U.S.A.:

Δ The author of *Snack Attack* for the Apple, **Dan Illowsky,** has formed a publishing company of his own, **Funtastic** (Drexel Hill, PA). His first product for the pc will be a more addicting, yet unfattening, version of his popular arcader called *Snack Attack II.*

More games are reported on the way.

Δ All **Axlon** (Sunnyvale, CA) marketing efforts, both domestic and overseas, will now be handled by **Donald L. Mandell,** who has joined the firm as vice president of sales and marketing.

"The peripheral industry is growing right along with the personal computer industry, and markets are becoming more diverse," says company president John Vurich. "Mandell's experience gives him firsthand knowledge of the industry in general, and user needs in particular."

Prior to joining Axlon, Mandell was regional manager with Commodore Business Systems and headed up a graphics and reproduction products firm that he founded.

Δ **Corona Data Systems** (Westlake Village, CA) has appointed **Loren Eltiste** as financial vice president and chief financial officer.

Eltiste brings thirteen years of related computer industry experience to his new post. For the past five years he served as financial vice president for Perci, a peripheral manufacturer based in Los Angeles. He also held a similar position with Pertec Computer and was involved in making that company public.

Corona also revealed that Wells Fargo Bank has extended them an unsecured line of credit for $500,000. The money will be used as working capital and inventories during the company's rapid increase in production of hard disk peripherals.

Δ An agreement has been reached between **Software General** (Austin, TX) and **Labyrinth Systems** (Great Neck, NY) to market three Labyrinth products. Software General provides sales and support in all parts of the United States and Canada for software aimed at the mainframe, mini, and multicopy microcomputer markets.

The three Labyrinth contenders are *I*COPS*, an interactive Cobol programming system; the *Liber*8 System* for documentation library organizing; and the *CICS Compression Routine.*

Δ Continuing their "major thrust in the consumer products area," **Microsoft** (Bellevue, WA) has announced the appointment of **Jim Spillars** as general manager of their consumer products division. Spillars was formerly vice president of sales at MicroPro International. His credentials include work for CAD-CAM Systems, MSI Data, International Data, and Xerox.

Δ The advertising agency of **D'Arcy-MacManus & Masius/San Francisco** (San Francisco, CA) has been awarded the **Information Unlimited Software** (Sausalito, CA) account.

They were chosen after a review of several Bay Area ad shops. "We were impressed with the agency's account and creative personnel as well as their understanding of the industry and their enthusiasm," says **William Lohse,** vice president for sales and marketing with Information Unlimited.

DM&M/SF will develop and place national and consumer trade advertising as well as develop collateral material. Other clients include California Canners and Growers, Crown Zellerbach, Delta Line Cruises, and the Idaho Potato Commission. The agency is part of a worldwide network with fifty-five offices in twenty-six countries.

Information Unlimited has also named **Paul D. Chaison** as vice president of research and development. Chaison, formerly with IBM, will oversee the activities of technical writing and programming as well as manufacturing functions.

Δ From Buffalo, New York, comes **Christopher Daly,** newly named vice president of marketing at **Software Distributors** (Culver City, CA). Daly was formerly part of the team that started Software Distribution Sources of Buffalo. The company currently has the fourth largest distribution in the gaming area.

While branch manager at a Radio Shack outlet, Daly took his store from 4,700th place to fifteenth in four months.

Software Distributors has also signed an agreement with **Ryan-McFarland** (Rolling Hills Estates, CA) to distribute the company's *RM-Cobol* full development systems as well as their run-time modules. Daly also announces that Software Distributors has expanded its capability to reformat existing software to forty-five types of micro systems, including Apple, IBM, Atari, TRS-80, and Zenith. CP/M publishers include Ashton-Tate, Digital Research, Microsoft, MicroPro, and SuperSoft. Game publishers include Sierra On-Line, Broderbund, Sirius, Datasoft, DataMost, and Avalon Hill. A twelve-person technical support team is being maintained as part of the reformatting program to handle dealer problems.

Δ New service options are available through authorized dealers for the pc, according to **IBM** (Boca Raton, FL). Designed to broaden service availability, the options come in two forms.

One is a nine-month nonrenewable option requested at the time of purchase. The other is a twelve-month renewable option that may be requested during the initial ninety-day warranty period or prior to the demise of a nine-month service option.

Separately priced options will also be offered for the system unit, printers, and monochrome display.

In a related action, IBM's customer service division has added a new nine-month warranty extension option for carry-in service to its current maintenance agreements. Prices have been reduced as much as 25 percent, and the number of service centers will top one hundred by January 1983. ▲

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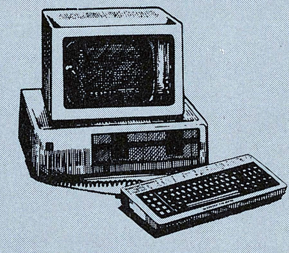

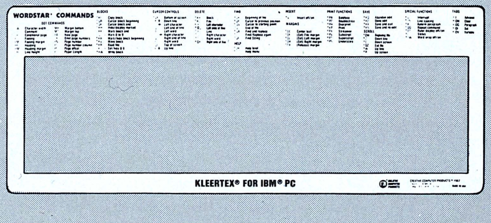

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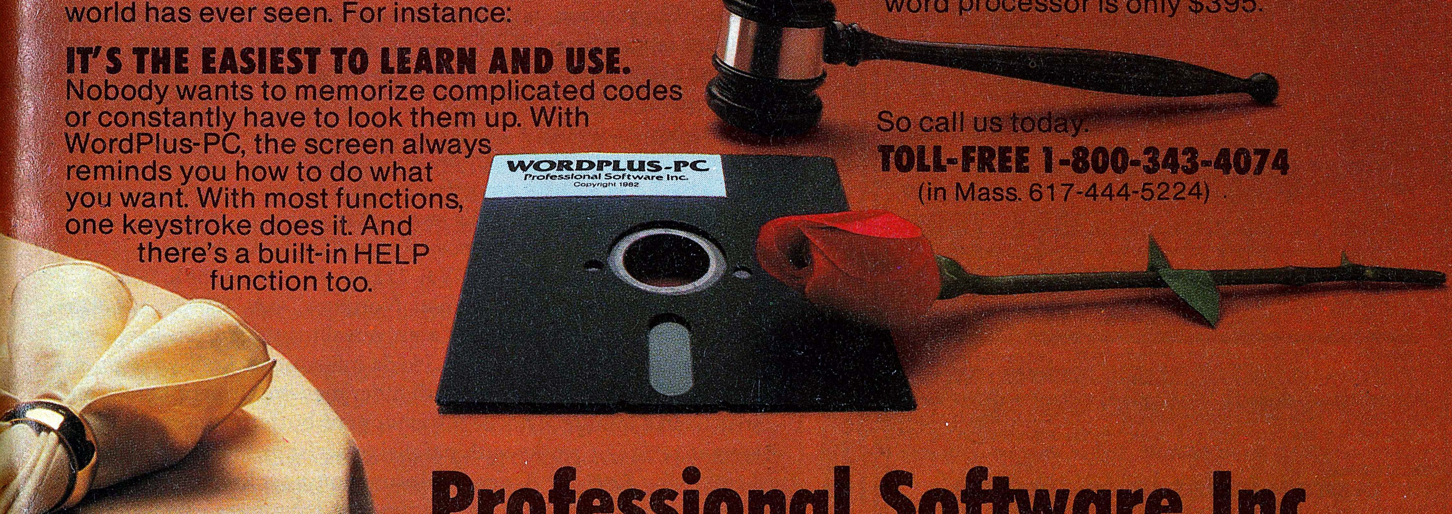

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WordPlus-PC was designed and written by Andres Escallon.

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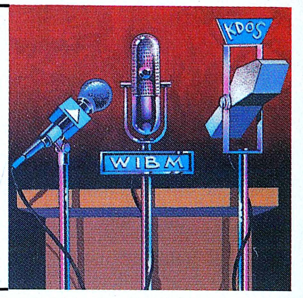

Unless otherwise indicated, software listed runs in DOS on machines with either display adapter and requires 64K and at least one disk drive.

Δ A new software package that combines spreadsheet, graphing, and information management is called *1-2-3*. From **Lotus Development** (55 Wheeler Street, Cambridge, MA 02138; 617-492-7171), it features 2,048 rows by 256 columns with half a megabyte model capacity; advanced cell and page formatting options; statistical, financial, and calendar functions; macro programming; and more. Features "what-if" graphing and a full standard repertoire of chart types. Produce memos, notes, outlines, tables, and reports. Full on-line tutorial with interactive help facility. Requires 128K and two drives. $495.

Δ A new memory expansion module is out from **CompuCable** (1440 South State College Boulevard, Suite 3-E, Anaheim, CA 92806; 714-635-7330). Features include upgradable memory from 64K to 256K in 64K increments, addressable as continuous blocks via jumper selection; on-board parity error detect and check; bidirectional data buffer; and 150 nanosecond access time. Pin compatible with the IBM pc bus. $319.95 in 64K configuration.

Δ *LEA2pc*, a comprehensive lease analysis program, has been adapted for the pc by **ATEL** (1350 Bayshore Highway, Suite 360, Burlingame, CA 94010; 415-342-2100). The original has been in use worldwide through General Electric's time-sharing network. The program can analyze tax leases, finance leases, tax benefit transfers, real estate transactions, and more. The company configures the system and offers lease plans. $8,000.

Δ Your Pascal pal: *Fundamentals of Microcomputer Programming, Including Pascal* instructs users in the basics of the language as well as a number of other topics, including computer linguistics. Not a how-to book but a handbook for the beginner who wants a thorough understanding of programming and languages. From **John Wiley & Sons** (605 Third Avenue, New York, NY 10158; 212-850-6000). Paperback, $14.95.

Δ Twenty-four pcs can share disk and printer resources with PCnet, a set of local area network interface cards from **PMS/MicroDisk** (Box 1377, Gardnerville, NV 89410; 702-782-8105). No pc serves exclusively as console. Includes record and file locking, print spooling and queuing, and remote processing by modem. $1,295.

Δ Squirm your way around ghosts protecting diamonds in a new maze game called *Squirm* from **TexaSoft** (1028 North Madison Avenue, Dallas, TX 75208; 214-941-8475). $35.

Δ Some new goodies from **IBM** (Box 1328, Boca Raton, FL 33432; 305-998-6007): *The Guide to Personal Computer Offerings from IBM* is an 84-page illustrated description of the pc and its features, including system hardware, service options, and software. $3. Δ A new IBM graphics printer is an enhanced version of the matrix printer, which it replaces. Features all-points-addressable graphics, two character sets (one adds international characters), superscript and subscript. $595.

Δ Seven additions to **IBM**'s library of business, professional, personal, and programming language software: *Multiplan*, by Microsoft, is a spreadsheet simulator. $250. *PFS:File*, by Software Publishing Corporation, is a data manager. $140. *PFS:Report* produces custom reports from *PFS:File*. $125. *Personal Editor* is a full-screen editor. $100. *The Basic Programming Development System* contains four advanced programming utilities. $130. *Diskette Librarian* creates and maintains a catalog of file names. $45. *Casino Games* includes blackjack, slot machine, and poker. $35.

Δ *Chess 1.3* is a chess game for eighty-column monitors. Features are board modification, skill levels changeable in midgame, and a self-playing mode for demos. From **PCsoft Consulting** (10317 Cherryview Court, Oakton, VA 22124; 703-281-1888). $20.

Δ **Quadram** (4357 Park Drive, Norcross, GA 30093; 404-923-6666) announces: Microfazer, a universal printer buffer, keeps you from waiting for your printer. Holds information until your printer can handle it, can be stacked with other modems or peripherals, and installs in a minute. Choose the amount of buffer memory you need—eight to 512K; works with parallel or serial printer or plotter. 8K, $169. 64K, $299. Δ A new multifunction board, Quad 512+, enables the pc to execute more of a program from memory rather than overlaying from disk. With increments of 64K, 256K, or 512K and a serial port. $475 to $1,295. Δ The MX-700 seventeen-inch CRT display terminal has a split-screen mode, holds up to sixteen letter-size pages of display memory, and displays any combination of characters with any combination of attributes (blink, half-intensity, double high, and so on). $2,395.

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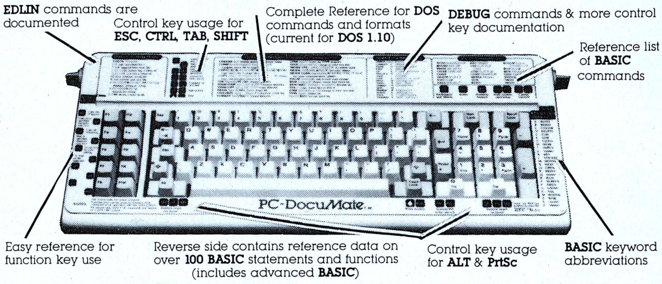
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Δ Corner your pc with a hardwood computer furniture system called Comp-U-Corner, from **John James Furnishings** (9015-A Meadow Vista Boulevard, Houston, TX 77064; 713-469-4508). The L-shaped unit features a choice of wood finishes and laminates, printer paper slots, and adjustable shelves. Each piece of furniture bolts together easily. Additional options that can be added include a drawer conversion kit and a mounted surge protector. $475.

Δ *R/BUF*, a software printer buffer, appends itself to DOS and intercepts the printer and clock interrupts invisibly. Will use all the RAM you have installed; requires no additional hardware. From **Cosmos** (10626 148th Avenue SE, Renton, WA 98056; 206-226-9362). $50.

Δ Create any one of forty presentation-quality chart types in minutes using *Graphwriter*, a business graphics package from **Graphic Communications** (200 Fifth Avenue, Waltham, MA 02254; 617-890-8778). Includes stacked and paired bars, triple pie, overlay, matrix, organization, and text (with multiple typeface options). Requires plotter and color/graphics adapter. $395.

Δ Up to 256K of dynamic RAM is available on a new card from **Apparat** (4401 South Tamarac Parkway, Denver, CO 80237; 303-741-1778). Card is software independent, is addressable on 64K boundaries, and has no wait states. $149 in 64K configuration.

Δ The *Data Base Management System* is just what it says. Creates files, compresses and sorts files, and generates reports. From **Universal Data Research** (2457 Wehrle Drive, Department B, Buffalo, NY 14221; 716-631-3011). $150.

Δ *Accounting for Profit* is a new software series from **Great Plains Software** (123 North 15th Street, Fargo, ND 58102; 701-293-8483). Package contains *The Hardisk Accounting Series, Version 2.0*, with general ledger and accounts receivable and payable, all with larger data fields. Also *Payroll* and *Inventory with Point of Sale, Version 2.0*, two new modules in the *Hardisk* series. *Payroll* does up to 9,999 employees, multiple compensations, and twenty deductions. *Inventory* holds up to 32,768 parts, does serial numbering, and allows sales history by item. $495 per module. *Inventory:* $595.

Δ Access more than two million businesses worldwide that have Western Union's Telex facilities, using *Quiklink*, from **ICR-Futuresoft** (1718 Kingsley Avenue, Orange Park, FL 32073; 904-269-1918). The software allows the user to compose memos, documents, or other text that can be sent as domestic or international online Telex, cablegram, or mailgram. Can be interfaced with *QuickPro* series database to permit messages to be sent selectively. Requires modem. Price to be announced.

Δ A new portfolio accounting and reporting system for the pc is announced by **Software Resources** (186 Alewife Brook Parkway, Suite 310, Cambridge, MA 02138; 617-497-5900). The *Micro-Master Professional Portfolio System* can handle almost any security, bond, money market instrument, or option; can deal with long and short positions; has a number of built-in reports; and features the *Report Writer*, which can be used to obtain virtually any report. Keeps track of portfolios and sub-portfolios; can also maintain records of tax lots, principal and income accounts for trusts, and commission dollars. $2,500. Hard disk: $3,000.

Δ *The RoseWare Directory* provides on-line access to over two thousand pc-compatible products from more than nine hundred vendors. Name, model number, price, hardware and software requirements, description, and vendor's address can be found for each listing. Entire database is updated every six months. Published by **OrthoSoft Systems** (1015 Gayley Avenue, Suite 323, Los Angeles, CA 90024; 213-457-7110). $30.

Δ CP/M '83, an International Exposition and Conference for the CP/M industry, will be held Friday through Sunday, January 21-23, at the Moscone Center in San Francisco. Sponsored by **Digital Research** and produced by **Northeast Expositions** (824 Boylston Street, Chestnut Hill, MA 02167; 617-739-2000). $10 for one day, $20 for all three.

Δ **Synergistic Software** (830 North Riverside Drive, Suite 201, Renton, WA 98055; 206-226-3216) has released *The Data Reporter*. The database includes sort and search, file merge, a reformatter, global editing, label making utility, and data calculation abilities. Comes with sample setups, optional password protection, batch file processing, and seven different search routines. $250. Δ Word processing *Report Writer* and a statistical and plotting accessory package, both intended for use with *The Data Reporter*, $100 each.

Δ A new generation Bell-compatible modem is announced by **Racal-Vadic** (222 Caspian Drive, Sunnyvale, CA 94086; 408-744-0810). The Auto Dial VA212 is a sleek, low profile unit featuring a front panel, tactile-touch keyboard with sixteen keys, an eight-character LCD display, and built-in automatic dialer. Provides full-duplex automatic or manual originate/answer operation; connects via data or voice jack. All circuitry on a single board. $795.

Δ A new computer language for the pc, called Thread, combines the best ideas of interpretive languages like Basic, Pascal, C, and Lisp. Features easy-to-learn syntax; full-function, built-in editor; structured language; compiler; interpreter; fast development and execution. Requires 128K. Available from **DWB & Associates** (Box 4609, Portland, OR 97208; 503-249-0412). $249.

Δ Simply answer the questions to do your taxes with *Personal Tax Planner*. It calculates all the math and income averages and provides complete tax summaries. From **Electronic Data Systems** (1212

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Δ Spreadsheet news: *Sideways,* from **Funk Software** (Box 1290, Cambridge, MA 02238; 617-497-6339), takes advantage of a printer's dot-addressable graphics capability to print out sideways by rotating the spreadsheet 90 degrees as it prints. Can also be used for listings and pert charts. Requires graphics printer. $60.

Δ *BPS Business Graphics* produces multicolor charts and graphs. Produces any combination of lines; horizontal, vertical, and multiple bars; pies; areas; and points. Performs statistical functions such as moving average, exponential smoothing, and curve fitting. From **Business & Professional Software** (143 Binney Street, Cambridge, MA 02142; 617-491-3377). $350.

Δ A communications package, *PC Modem Plus,* from **Ven-Tel** (2342 Walsh Avenue, Santa Clara, CA 95051; 408-727-5721) links you to the Source and Dow Jones and sends electronic mail. All in one kit: auto-answer/auto-dial 300 baud modem with buffer, extra serial port, software, cable, and instructions. Expandable to 1,200 baud full duplex. $389.

Δ Software for talent agents: *IBIS (Integrated Booking Information System)* is a database that prints contracts, maintains performers' schedules, holds sponsor data, and identifies potential buyers. From **Harper Business Systems** (910 179th Court NE, Bellevue, WA 98008; 206-643-9762). $2,500.

Δ Create single keystroke abbreviations for strings up to 1,000 characters with *ProKey,* from **ProSoft** (4744 9th Avenue NE, Box 5850, Seattle, WA 98105; 206-632-3603). Keyboard customizer installs itself into DOS, can be used in any program without editing. Save up to ninety custom strings. $50.

Δ Casual and experienced real estate investors can now do comprehensive, five-year analysis of proposed investments with *Real Estate Investment Analysis System,* from **National Investment Services** (Box 586, Citrus Heights, CA 95611; 916-723-9822). The *REIA System* provides reports; income, expense, and cash flow analysis; and shows tax implications and return on investment. $120.

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Δ A statistical analysis package called *HAL3001* is announced by **Keller Software** (1825 Westcliff Drive, Newport Beach, CA 92663; 714-642-2380). Single or double precision data can be entered; the mean, standard deviation, variance, median, high, low, range, and standard error are interactively printed; several kinds of regression can be made; and four kinds of tests are available. Format is custom fit to your specifications. $495.

Δ For UCSD p-System users, here's a communications/terminal emulator, from **R. F. Belanger** (7122 Cather Court, San Diego, CA 92122; 619-450-1108). The program, called *p-Comm,* supports a phone directory, has auto-dial, redial, semiautomatic log on, upload and download, transmission throttling, and printing. Send formatted disk in self-addressed mailer for copy; contributions encouraged.

Δ A five megabyte hard disk system for the pc is now available from **Computer Dynamics** (105 South Main Street, Greer, SC 29651). The WIN 5-IBM features a sealed Winchester drive with error detection and correction with a 4.8 megabyte transfer rate. $1,695. Δ A battery backed-up, uninterruptable DC power supply, the UPS F-61 Power Supply, is designed to furnish regulated amps in environments where fluctuations aren't wanted. $230. Δ A high-speed 256K dynamic RAM card for the Z80-STD bus provides memory easily configurable in 8K segments. $445.

Δ **Money Tree Software** (550 SW Fifth Street, Corvallis, OR 97333; 503-757-1114) announces *The Tax Planner,* a template for *VisiCalc* that allows the financial advisor to determine the impact of Federal income taxes upon a given investment proposal. Computes two and five year effects. $300.

Δ Transfer information back and forth between Apples and pcs using the *Apple-IBM Connection,* from **Alpha Software** (6 New England Executive Park, Burlington, MA 01803; 617-229-2924). Transfer *VisiCalc, WordStar* files without rekeying; send and receive electronic mail. Requires port and modem in pc, Hayes Micromodem or Mountain CPS card in Apple. $195.

Δ *Aqua Run* is an underwater arcade game where you are the diver seeking treasure protected by vicious creatures. From **Soft Spot Micro Systems** (Box 415, North Canton, CT 06059; 203-379-7047). $39.95.

Δ Software available from **Richard Caldwell** (60 Braemoor Drive, Santa Cruz, CA 95060; 408-423-9400): *Mailing List* prints on labels, holds 400 lines per disk. $40. Δ *Graphics LPrint* prints screen graphics. $40. Δ *Performance Analysis of Passive Solar Heated Buildings* calculates heating load and energy required per month or year. $200. Δ *Cost Estimating* estimates cost for contractors, engineers, and architects. $300.

Δ The *Architectural Engineering Master Accounting System (AEMAS)* is available from **Data Basics** (11000 Cedar Road, Suite 110, Cleveland, OH 44106; 216-721-3400) for architectural and civil, structural, and mechanical engineering firms. Job costing and payroll modules released. Financial data on a project, accounts receivable and payable, and general ledger modules ready by June. Hard disk and 128K required. $798 and $998 per module.

Δ *PrtSc,* pronounced "print screen," works as an extension of DOS and can be used when needed to print a screen image with a press of the key. From **Radio Technology** (8 North Main Street, Suite 111, West Hartford, CT 06107), the software supports all 256 text characters, monochrome and color displays, reverse video, underlining, and storage of images. Dot addressable graphics printer required. $65.

Δ The *Pro Football Game* simulates a professional football contest including ten offensive plays, five defenses, interceptions, fumbles, penalties, and more. Displays of the playing field and scoreboard included. From **Strategic Alternatives** (459 Homer, Suite 2,

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Palo Alto, CA 94301; 415-328-4121). Eighty-column display required. $23.75.

Δ *Crossfire* comes to the pc! The popular home-arcade game from **Sierra On-Line** (36575 Mudge Ranch Road, Coarsegold, CA 93614; 209-683-6858) requires strategy and concentration in an action-packed battle with alien hordes on a grid laid out like city blocks. Requires color/graphics adapter. $29.95.

Δ Gather dots, catch monsters, and collect prizes when you play *Chomps,* a new maze game from **Ensign Software** (7337 Northview, Boise, ID 83704). Four different mazes. $29.95.

Δ There's hyperaction in hyperspace when you play *Galactic Encounters,* from **Micro Productions** (Box 147, Georgetown, TX 78626; 512-863-3079). As commander of the *Illiad,* you must destroy all of the Kaons in your galaxy. Successfully defend five galaxies in this strategy game and win the golden chalice. Requires eighty-column screen. $29.95.

Δ **Davong Systems** (610 Palomar Avenue, Sunnyvale, CA 94086; 408-773-8370) announces the *Multiple Operating System* that allows you to add UCSD-Pascal and CP/M-86 to DOS. Easily switch from one to the other. $99.

Δ A full-screen editor that provides cursor control, horizontal and vertical scrolling, insert, delete, and more has been released by **Sunshine Computer Software** (1101 Post Oak Boulevard, Suite 9-493, Houston, TX 77056; 713-552-0949). $75.

Δ *Data Base Management Systems* is a book that explores, in depth, three types of database systems: file, relational, and network/hierarchical. Provides standards for evaluating software and examines several packages, including *Condor Series 20, dBase II, FMS-80,* and *DataStar.* Published by **Osborne/McGraw-Hill** (630 Bancroft Way, Berkeley, CA 94710; 415-548-2805). Paperback, $16.95.

Δ Transfer programs, text files, and spreadsheet data of any length from the Radio Shack Model I and Model III systems to the pc with a package from **Personal Computer Products** (1400 Coleman Avenue, Suite C-18, Santa Clara, CA 95050; 408-988-0164). Communication programs and adapter for both systems included. Requires RS-232 port on each machine. $39.95.

Δ **Stoneware** (50 Belvedere Street, San Rafael, CA 94901; 415-454-6500) has released a pc version of their popular *DB Master.* The new edition of the database management system allows a 3,000-character record, includes a browse mode, and can print more information per record and view more pages than the Apple version. $499. Δ A video training tape entitled *How To Use Your IBM Personal Computer* provides ten lessons on the system that show the computer at work. Learn at your own pace. $120.

Δ *Plan80* is a financial planning system that reviews assumptions and methods; translates work sheets; calculates averages, depreciation, internal rate of return, and trig functions; and consolidates files. Requires CP/M-86. From **Digital Marketing** (2670 Cherry Lane, Walnut Creek, CA 94596; 415-938-2880). $295.

Δ**VisiCorp** (2895 Zanker Road, San Jose, CA 95134; 408-946-9000) introduces the *VisiWord* word processing system and its companion, *VisiSpell,* a spelling checker. *VisiWord* has an advanced window feature that lets you dynamically merge files; *VisiCalc* models can be inserted into finished documents. *VisiSpell* has a 100,000-word dictionary. *VisiWord:* $375; *VisiSpell:* $225. Δ *VisiCalc Advanced Version,* a second generation of the bestselling spreadsheet program, creates templates that can easily be used by a novice. It has built-in financial functions, extensive help and protection facilities, and features that facilitate its use on a corporate-wide basis. $400. Upgrade from *VisiCalc:* $200. Δ *VisiON* is a new software interface that creates windows for various applications and uses a "mouse" in place of a keyboard-controlled cursor. All previous and future Visi products will ultimately be compatible with the system. Multiple applications require 256K of main memory and 620K of disk space. Price to be announced.

Δ A new removable cartridge, 5 megabyte Winchester drive is announced by **Tecmar** (23600 Mercantile Road, Cleveland, OH 44122). The unit installs directly into the pc and offers the unlimited memory and memory swapping of a floppy disk system. $1,795.

Δ The entire *EasyFamily* line of professional software, including *EasyWriter II, EasyFiler, EasyPlanner,* and the *Financial Management Series,* has been adapted to PC-DOS by **Information Unlimited Software** (2401 Marinship Way, Sausalito, CA 94965; 415-331-6700).

Δ **VenturCom** (139 Main Street, Cambridge, MA 02142; 617-661-1230) has announced what they say is the first genuine *Unix* operating system for micros. Dubbed *Venix,* it comes in an integrated *Project Viking* package with *The FinalWord* word processor, *Logix,* a relational database manager, and a graphics package called *Graphix.* $1,000. Δ *Proforms* is a time and billing package for professional service firms. Price to be announced. Δ *TEQ* plots and evaluates mathematical functions found in science, engineering, and business. $300. Δ *SigPak* is a signal processing package for applications involving time-series data. $5,000.

Δ A new, fast-action arcade game called *Ramsak* has you grabbing dots, bars, diamonds, and mushrooms; energizing to kill bugbears, and exploding bricks for points. From **Heigen** (Box 15163, San Francisco, CA 94115; 415-398-8050). $29.95.

Δ Irma, an interface board that links pcs to IBM 3270 controllers, is announced by **TAC** (120 West Wieuca Road NE, Atlanta, GA 30042; 404-252-1045). The board fits into any available slot and attaches via coaxial cable to the 3270 and emulates an IBM 3278 display. $1,200.

Δ Modular architecture from **Sritek** (3637 South Green Road, Cleveland, OH 44122; 216-292-0011): Z-80 MicroCard provides CP/M compatibility. $195. Δ 8086 MicroCard transparently runs software three to four times faster. $595. Δ 68000 MicroCard/Unix is an operating system with integrated business software. $795.

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Δ 80286 MicroCard provides multi-user expansion. Price varies. Δ 16032 MicroCard provides VAX-like functionality. Price varies.

Δ *How To Use SuperCalc* is a new book intended as an introductory management guide to financial spreadsheet programs with a special emphasis on *SuperCalc*. Includes a general introduction, a tutorial, and a reference manual. Published by **dilithium Press** (11000 S.W. 11th Street, Suite E, Beaverton, OR 97005; 503-646-2713). $19.95; book and disk: $29.95.

Δ **Designer Software** (3400 Montrose, Suite 718, Houston, TX 77006; 713-520-8221) has released the *Palantir* word processing system. Menu-driven with logical commands, the system boldfaces, underlines, and prints inverse video. Includes a form letter function called *Mailout*. $400.

Δ A computerized speech system, called *SPeachware*, produces human-quality speech and is capable of storing eight hours of continuous speech on a 20 megabyte disk. The system uses the Sybil synthesizer board to digitize the human voice as it is spoken, in waves, as opposed to the word and phrase spacing method. From **Peachtree Software** (3445 Peachtree Road NE, Atlanta, GA 30326; 404-262-2376). $400.

Δ *Quick-Text* is a word processor and text editor that features and performs like similar products costing four times more, according to **Distributed Software Systems** (950 Knollwood Drive, Buffalo Grove, IL 60090; 312-634-1511). Includes spelling checker. $55.

Δ **Port-A-Soft** (423 East 800 North, Orem, UT 84057; 801-224-2852), formerly Disk Copy Service, announces an increase in the disk formats it is able to convert to and from. Now they can also convert CP/M disks to Osborne, Xerox 820, and the IBM pc CP/M-86. $5 to $15 per disk.

Δ A series of Winchester disk drives is announced by **IDE Associates** (44 Mall Road, Burlington, MA 01803; 617-272-7360). The DPR series utilizes SyQuest Technology's 3.9 inch drive, with the choice of fixed or removable cartridge with a 5 megabyte formatted storage capacity. The Controller Card has built-in error checking and correction. With software and mounting hardware. Internal mount version: $1,450; external mount: $1,650. Δ The XPR series of multifunction combination cards is available with up to 256K, parallel port, serial port, and clock/calendar/battery. $350 to $650. Δ The MPR-512 Memory Card, dubbed "the big board," contains 512K memory and occupies only one slot. Disk emulation software included. $915. Δ The MPR Memory Card has up to 256K, in 64K increments, along with full parity checking and generation. $275 to $575.

Δ *Personal Financial Assistant* maintains financial information for home or a small business familiar with the double-entry accounting method. Five to 300 accounts may be defined. From **L C Systems** (Box 5360, Coralville, IA 52241; 319-354-2630). $100.

Δ Need a hand? Rhino XR-1 32-inch robotic arm is available from **Sandhu Machine Design** (308 South State Street, Champaign, IL 61820; 217-352-8485). Built with the same operating technology as large industrial robots, the Rhino can be used with any RS-232 port or modem. Features open-aluminum construction, six DC servo gear motors, a controller card with Intel 8784 CPU, a 22.5-inch reach, and a 2-inch grasp. Comes with power pack, cables, manual, and tool kit. $2,400.

Δ **Single Source Solution** (2699 Clayton Road, Concord, CA 94519; 415-680-0202) has released *Stockmap*, a program by Charles Pack designed to monitor the performance of stocks or commodities on a weekly basis and print out a fifty-two-week, detailed graph of selected performance indicators. *Stockmap* includes long and short-term moving averages, highs and lows, and volume, among other indicators. $49.95. ▲

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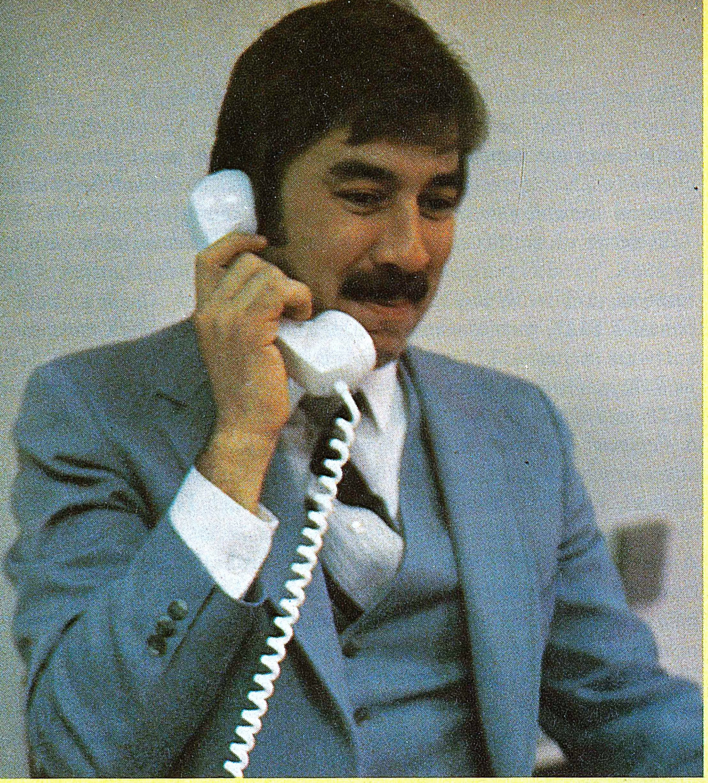
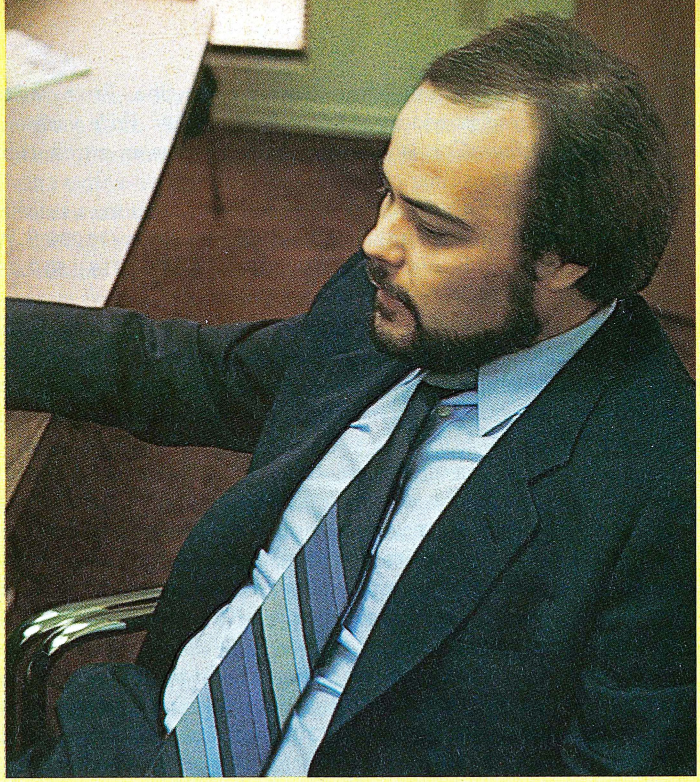
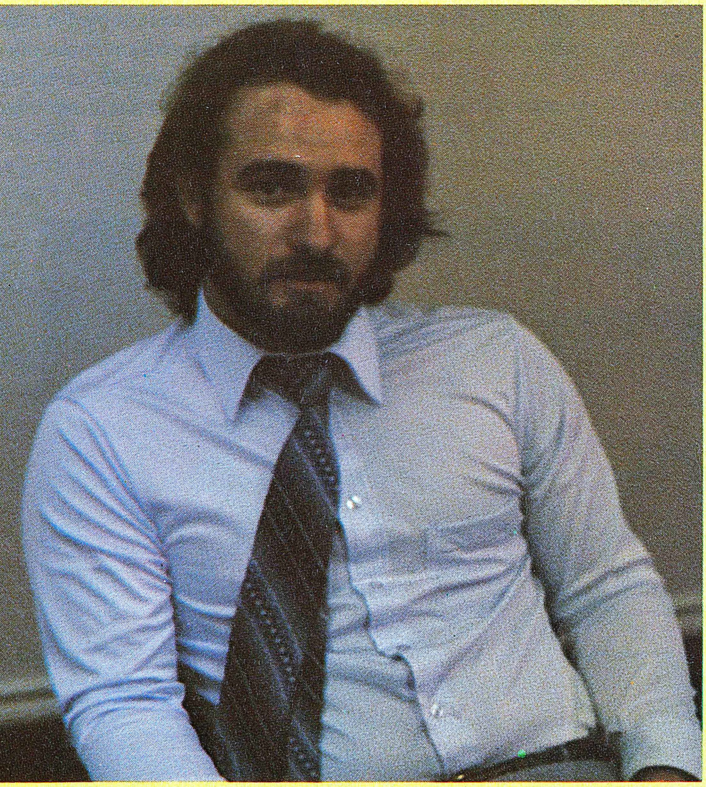
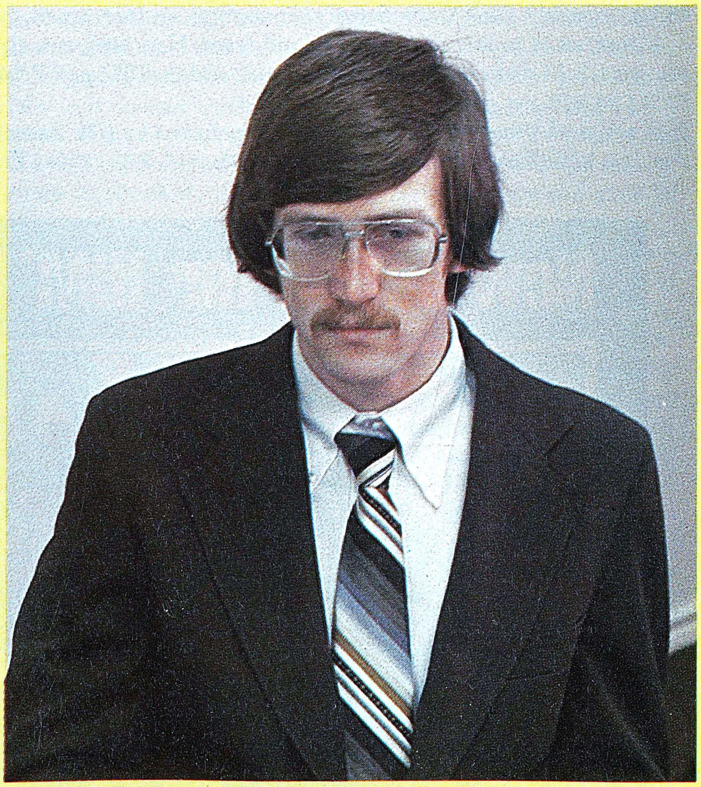






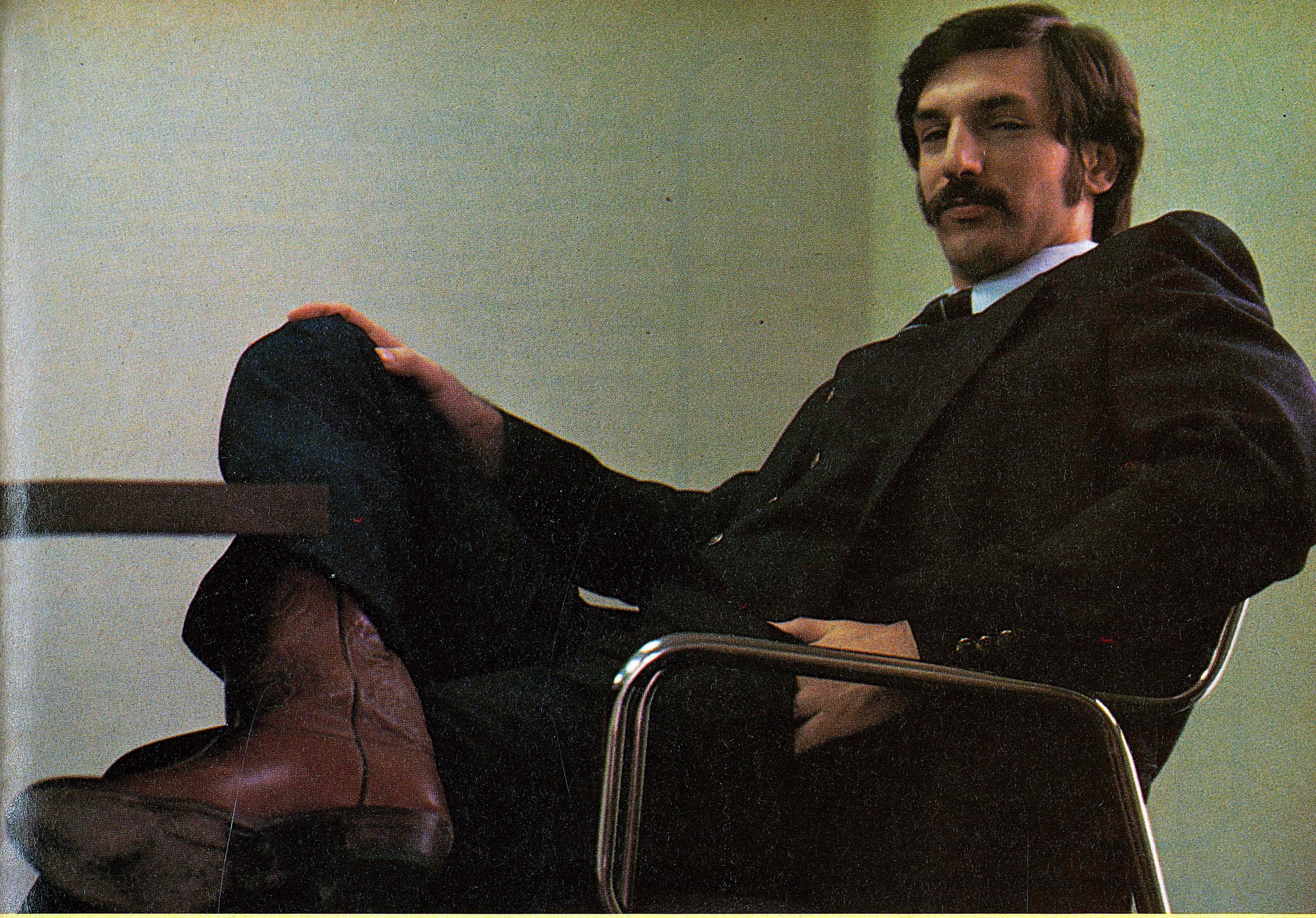


by Forrest Johnson

There is a new building going up in the Dallas suburb of Arlington, Texas, where horses compete for pasture with real estate developers. But it is not a new shopping center or a brick-facade apartment complex. Its 4,000 square feet will hold FriendlySoft, one of the fastest growing companies in the software business.

Despite the competitive market, FriendlySoft's *PC Introductory Set* is becoming an institution on the Bestsellers list, like *VisiCalc* and *WordStar*. And that's heady stuff for the 32-year-old chairman who, this time last year, knew nothing about computers and was only interested in selling pizza.

A Mi-De Big Impression. Mike Yaw, with his wife Debbie, is the owner of Mi-De (pronounced "mighty") Pizza, a fast food chain that still generates much of his income. Last year, he was thinking about using microcomputers to improve his business, so he decided to take in a seminar at the West Coast Computer Faire in San Francisco.



EXEC FRIENDLYSOFT NOT JUST SITTING PRETTY

Chairman Mike Yaw (upper left) founded the company with the assistance of now-President Jim Davis (upper center) and programmer Frank Smith (above), who now heads the FriendlyWriter *team. Al Vanchura (lower left), who directed development for* FriendlyWare PC Arcade, *and Bruce Moore (lower center) both joined the company after responding to a newspaper ad.*

It was the Faire that convinced him that computers were the coming thing. "I went out there and I was immediately awestruck by the industry. There were tens of thousands of people. I had literally a dozen people come to me and talk about financing. They would say, 'I need ten thousand to develop this program,' or 'I need twenty-five thousand for that.' But I knew that, acting alone, they could never achieve their goals."

Nevertheless, Yaw left the fair convinced there was a lot of money to be made in software. "I went home and told Debbie, 'We may not be buying that new house after all. I have an investment to make.' "

After his wife, there were two people he needed to talk to, two people whose help would be essential to the company. He had known Jim Davis (now president of FriendlySoft) from the processed foods industry. Davis had no experience with computers, but lots with marketing. Frank Smith, on the other hand, was a systems

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programmer for a corporation. Both men knew what Yaw could do when his enthusiasm was fired, and both agreed to help him with the company.

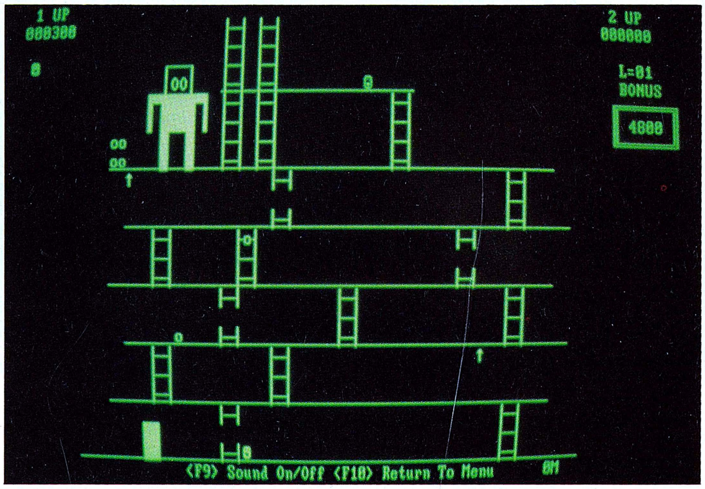
The first decision they made was to base their products on the IBM Personal Computer. The machine was new, the market was open, the prospects for growth were excellent. To this day, they have no plans to write software for the Apple, TRS-80, or any other computer. Instead, they will devote themselves to expanding their share of the IBM market.

Programmers Wanted. The typical software company gets its start when a programmer has an idea for a product and decides to go into business. Yaw took the opposite approach. He started the company, bought four Personal Computers, and then went looking for someone to program them.

So how do you find programmers in this intensely competitive business? You advertise in the newspaper!

Yaw's ad attracted a number of prospects. One was Al Vanchura, who had been working on a golf course. To be sure, Al did have years of experience with micros. He had bought a Heathkit computer way back in 1978, and learned to program in assembly language because the thing didn't have enough memory for Basic.

Vanchura arrived at Yaw's office in scruffy clothing and a sixties car. He looked like he might be applying for the position of errand boy rather than programmer, but Yaw was more impressed with his ability than his appearance. "He showed me a program on a TRS-80, and walked out ten minutes later with a four thousand-dollar system. I didn't even have his phone number. Debbie told me I was crazy."



A game from the coming FriendlyWare PC Arcade *shows what can be done with humble text-mode graphics.*

Among the other programmers recruited at that time were Bruce Moore and John Leatherwood, both of whom became coauthors of the introductory set, with Yaw, Davis, Smith, and Vanchura. Some of Yaw's people worked for royalties and some were on salary, but all worked hard. The first code was written in May, and FriendlySoft was ready to send out samples in July.

Making Introductions. The original FriendlyWare set was written in Basic. It included three disks and a fifty-page instruction book. Games occupied most of two disks, and simple business software was on the third. There were, in addition, a biorhythm program, hearing and vision tests, and a graphics demonstration. As the name of the package implied, there was also an introduction to computing. It provided some basic history and concepts, and gave the user a quick tour through the innards of a Basic program, one of the games on the disk.

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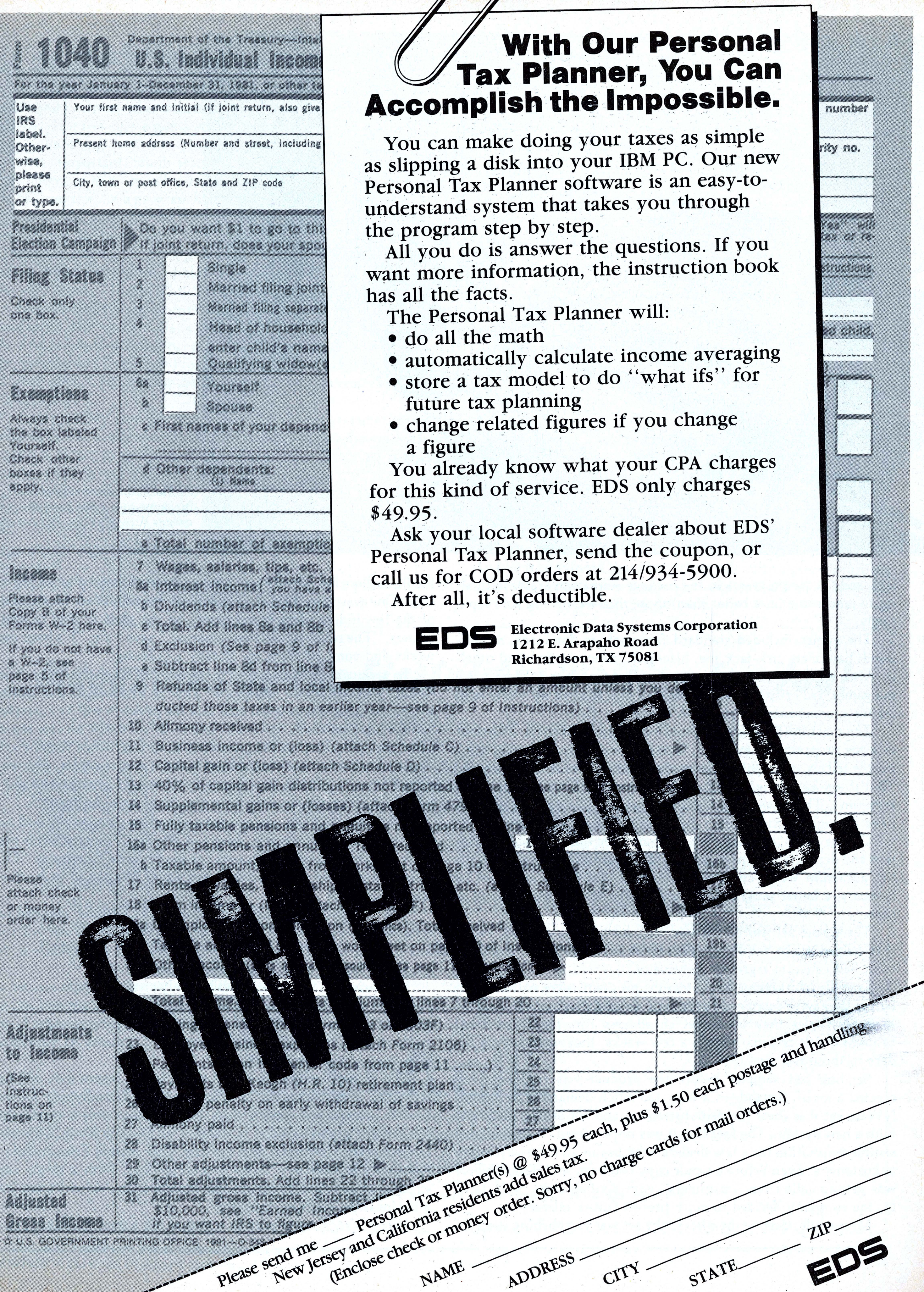

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7 Wages, salaries, tips, etc.
8a Interest income (attach Sche you have
b Dividends (attach Schedule
c Total. Add lines 8a and 8b
d Exclusion (See page 9 of In
e Subtract line 8d from line 8
9 Refunds of State and local income taxes (do not enter an amount unless you de ducted those taxes in an earlier year—see page 9 of Instructions)
10 Alimony received
11 Business income or (loss) (attach Schedule C)
12 Capital gain or (loss) (attach Schedule D)
13 40% of capital gain distributions not reported
14 Supplemental gains or (losses) (attach Form 479
15 Fully taxable pensions and
16a Other pensions and annu
b Taxable amount
17 Rents
18
19a
20
21 Total

Adjustments to Income
(See Instructions on page 11)
22
23
24 code from page 11
25 Keogh (H.R. 10) retirement plan
26 penalty on early withdrawal of savings
27 Alimony paid
28 Disability income exclusion (attach Form 2440)
29 Other adjustments—see page 12
30 Total adjustments. Add lines 22 through

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EDS

Al Vanchura demonstrates a Breakout*-style game from the coming* FriendlyWare PC Arcade.

lars, and (3) the programs in the package were comparable in quality to (and sometimes better than) those that were being sold separately.

The games included standard fare such as dominoes, mastermind, hangman, tick-tack toe, blackjack, concentration and othello. Also, there were sports programs—*Head Coach* and *PC Golf.* All the games had crisp text-mode graphics that showed up nicely both on the monochrome display and in color.

The machine plays a pretty mean game in all of them. The tick-tack toe program, for example, literally never loses. "We had some people tell us we should have made it easier to win," Yaw recalls. "But if we had done that, they would have said it was a crummy program." Those who enjoy strategy games will agree it is better to have a tough opponent than one who offers no challenge.

On the financial disk were programs for things like amortization and depreciation, inventory reorder, and stock analysis. But the big attraction was a checkbook program that coded expenses by category, a better program than many offered at prices of $100 or more.

The whole set was distributed without copy protection. While that helped make the FriendlyWare set "friendly," the company soon had cause to regret its generosity.

Friendly Marketing. As soon as the programs were written, even before they were completely debugged, FriendlySoft sent free copies to every dealer they could get an address for. This investment brought quick returns; within a few weeks, they were getting orders in thousand quantity.

Sending out samples before the product was ready to ship created a lot of demand—in a way, too much demand. The FriendlyWare set was ideal for demonstrations and for selling packaged with a new system. The fact that it was unprotected created an irresistible temptation for a few dealers, who began giving away copies to customers. Even before a single copy had been sold, FriendlySoft was getting calls from "customers" with bootleg disks. Reluctantly, the company decided to copy protect future releases.

Meanwhile, despite the piracy, the set was establishing itself on the Bestsellers list. The Texas company started to get a lot of phone calls. One was from IBM. In November, FriendlyWare became one of the few independent brand names on the shelf at IBM product centers. "The response has been amazing," says Yaw. "It's been two weeks and some of them are already reordering."

To cap its marketing strategy, FriendlySoft maintains a 24-hour hotline for customers' questions. This is unusual in a business where the customer is often told that his problem will be corrected "in the next revision," or is referred to a "customer service representative" who has no programming experience. At FriendlySoft, the customer will be answered by one of the programmers, who take phone duty in rotation. Yaw himself answers the phone one night a week. "It helps me get a feel for our problems," he says.

What Next? While one success can make a company, it will not keep it growing indefinitely. Aware of this fact, FriendlySoft is preparing a whole range of software for the Personal Computer. "Our projections are very aggressive," says Yaw. "We aim to be up there with VisiCorp."

The company's second product will be *PC Arcade*, planned for release in January. It will bear the FriendlyWare brand and will follow the formula that made the introductory set so popular—a low price and several programs in one package.

Whereas the introductory set has only strategy games written in Basic, the new package will be devoted to arcade games and will be written in assembler. "We had to go to assembler because it's faster and you have full control of the machine," explains Al Vanchura, who is directing the project.

The graphics will all be in text mode, which means they will run on either a monochrome or color monitor. FriendlySoft doesn't want to promise any specific titles, but it is reasonable to expect that we will see games familiar to players of *Donkey Kong, Defender, Lunar Lander, Centipede*, and the like. One feature FriendlySoft *is* willing to promise is a "boss is coming" key. With a single keystroke, you will be able to turn that incriminating video display into a businesslike chart or template.

While Vanchura is putting together the games package, Frank

Smith is managing the *FriendlyWriter* project. *FriendlyWriter* is not a high-priced word processor designed to compete with *WordStar*. It is an inexpensive letter-writing program designed specifically for office work. On a "what you see is what you get" screen there are friendly features like automatic word wrap and justification, and easy underlining.

Most important, Smith wants to design a program a secretary could boot up and use without constantly referring to the manual. He believes that, in a program like this, the mechanics should be invisible, in the same way an electric typewriter's workings are. The user should not be bothered with embedded commands or multiple keystrokes, but should be able to see things like margins and spacing on the screen and manipulate the text as if it were written on a piece of paper. "That's what the computer's for," Smith says.

FriendlyWriter is scheduled for release this spring. After that, the company's development plans are not firm, but Yaw intends to offer a heavy-duty accounting package before long. David Schneider, president of Computer Program Associates, is preparing one. If all goes well, CPA will design the package and FriendlySoft will market it.

Appropriately enough, Schneider is not a programmer, but a certified public accountant. He has a number of programmers working on a ledger program with accounts payable, accounts receivable, payroll, inventory, and fixed assets.

Schneider works well with Yaw, since they have the same design philosophy—programs should be written for the least-experienced user. "Software everywhere is getting more friendly," says Schneider, "and it's the inexperienced users that account for the growth of the market."

Tentatively, Yaw and Schneider are aiming at a price under $500. However, Schneider feels that is not the point. "It's not the price. It's what the software does."

Fortunes in Friendliness. As much as Mike Yaw believes in the future of the software industry, he would rather have people stay out of it than go in half prepared. "I feel sorry for the guy who has $10,000 and spends his savings to start a computer business," he says. "We spent $10,000 in advertising before we ever sold a copy.

"Say you're selling two thousand copies a month at $50 each. Suppose everyone takes thirty days to pay. That means you're operating with receivables of $100,000.

"I don't want people to think it's easy because it's not. It's six figures. You couldn't do it for less."

Ever more important is teamwork, a favorite buzz word in Yaw's office. Over and over, Yaw emphasizes the importance of putting together a good team, working them hard, and rewarding them fully for their efforts.

Yaw did not allow anyone to take credit for any individual part of the *PC Introductory Set*, but he made sure all six of the contributors were jointly credited in the manual. "Everything that we do is a joint decision. We had team meetings so often that the programmers said, 'We like your team meetings, but we would rather be home programming.' "

He speaks with pride of the sacrifices his people have made. "Frank took his computer down to his home in Killeen, Texas, over Thanksgiving. I wonder how his mother felt about that!"

He takes real pleasure in the prosperity FriendlySoft has brought to the individuals who work with him. "I am proud to say that Al doesn't have to work nine to five anymore. He can go home and be with his wife and children if he wants."

And he is convinced that team effort will mean a great future for FriendlySoft. "You put a good team together and everyone gets rich. You can't hold back a good team." ▲

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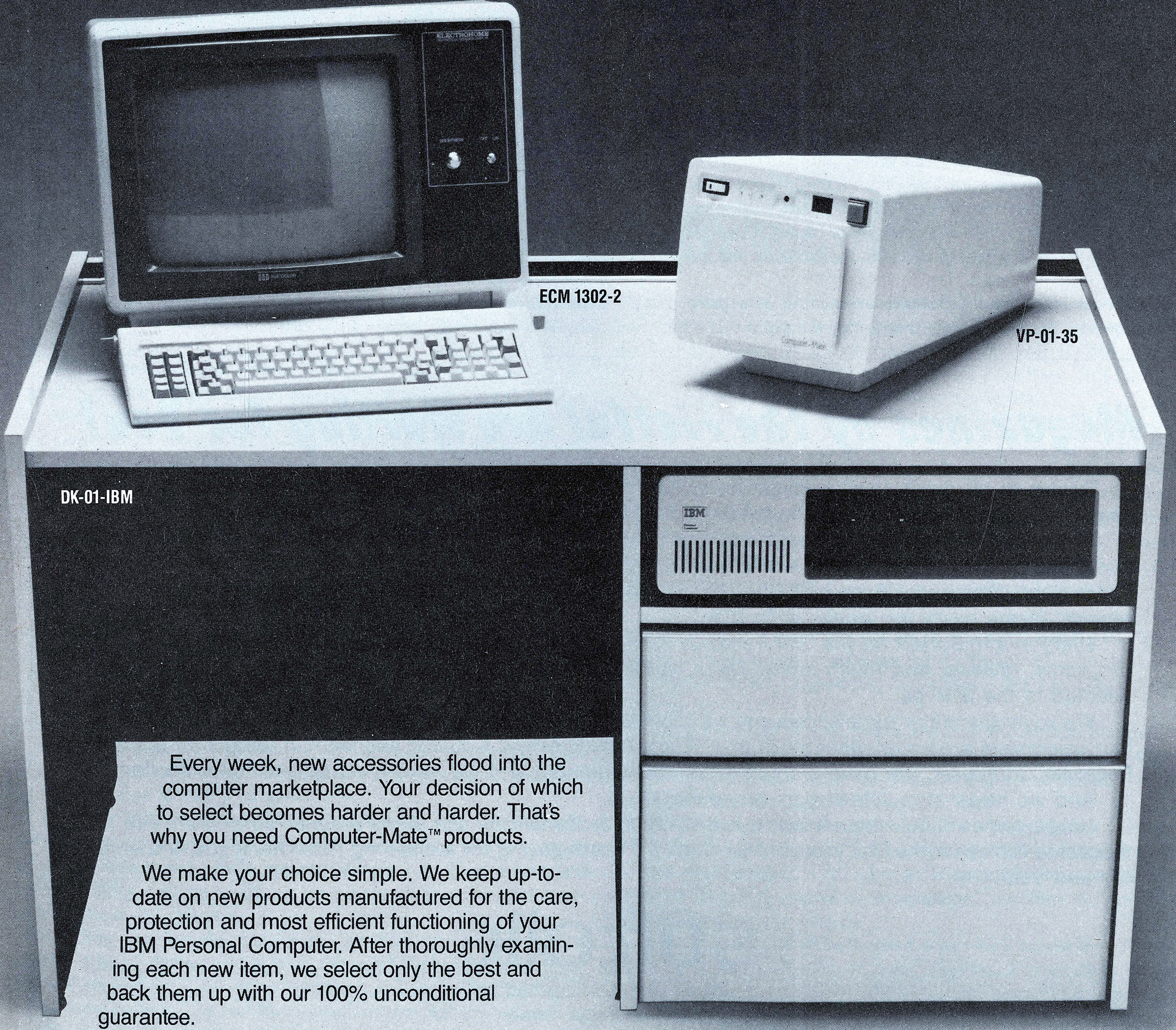

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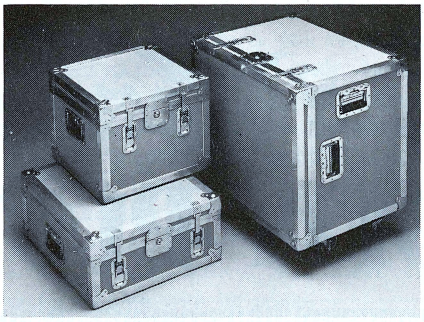

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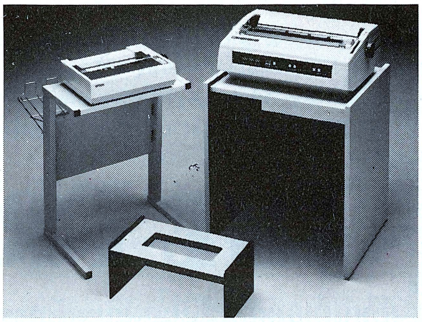

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THE PROFIT PLOT

by
Shirley Fisher

Whatever your line of business, you have probably experienced times when you had to make a difficult purchasing decision. Perhaps you had to choose between one lease agreement and another or one auto and another—maybe even between one computer system and another.

Perhaps you found yourself facing a perplexing set of choices. Each selection may have had many of the features you wanted, but none had all. How could you make an intelligent decision and pick the best option available?

Fortunately, there's a technique called *weighted decision making* that can help in situations like this. And your spreadsheet program can help you implement this decision-making technique.

The idea behind weighted decision making is fairly simple. Whatever it is you're looking at can usually be divided up into several major components. Within the major components there may be some further subdivisions. Let's see how we can use the spreadsheet to make sense of these divisions and subdivisions.

First, make a list of all the major components for the purchase under consideration. This list should include all the features you would like to have in a hypothetical perfect selection.

Second, give each of these major components a percentage rating that represents its relative importance. The percentage rating should indicate how much you really want to have each option. If it would be difficult to do without an option at all, that one will get a much higher rating than if it is of more minor significance. If it's an item contained in all the purchases under consideration, its rating will not be as high. Differences here will be weighted in a quality factor; but we'll get to that in a minute.

After you've given each major component a rating, total them. They should add

	A	B	C	D	E	F	G	H	I	J	K	L	M
	RATING 1 (%)	MAJOR COMPONENTS	RATING 2 (%)	SUB-OPTIONS	PRICE	CAR A	QUALITY	FACTOR		PRICE	CAR B	QUALITY	FACTOR
1		BASE							///				
2	.15	PRICE			24500		3	.45	///	26075		4	.6
3									///				
4	.18	MUSIC SYSTEM							///				
5			.3	AM/FM RADIO	0		3	.162	///	0		5	.27
6			.7	AM/FM & TAPE	275		5	.63	///	300		5	.63
7									///				
8	.11	UPHOLSTERY							///				
9			.4	VINYL	0		5	.22	///	0		5	.22
10			.6	VELOUR	600		4	.264	///	575		4	.264
11									///				
12	.17	TRANSMISSION							///				
13			.35	STANDARD	0		4	.238	///	0		5	.2975
14			.65	AUTOMATIC	250		0	0	///	450		1	.1105
15									///				
16	.25	AIR							///				
17		CONDITION	1		650		3	.75	///	875		5	1.25
18									///				
19	.04	BODY STYLE							///				
20			.9	4-DOOR	680		3	.108	///	385		5	.18
21			.1	WAGON	1150		5	.02	///	0		0	0
22									///				
23	.08	CRUISE CONTROL			0		5	.4	///	245		5	.4
24			1						///				
25	.02	SUN ROOF	1		450		4	.08	///	345		5	.1
26									///				
27									///				
28													
29													
30													
31													
32					PRICE	CAR A	QUALITY	FACTOR		PRICE	CAR B	QUALITY	FACTOR
33													
34					28555		44	3.322		29250		49	4.322
35	1: PRICE*FACTOR/QUALITY					2155.903					2579.969		
36	2: PRICE/QUALITY					648.9773					596.9388		
37	3: PRICE/FACTOR					8595.725					6767.700		
38													
39													
40													
41		CAR A	CAR B	CAR C	BEST VAL.	WINNER							
42	1: PRICE*FACTOR/QUALITY	2155.903	2579.969	1881.537	MAX	CAR B							
43	2: PRICE/QUALITY	648.9773	596.9388	732.2581	MIN	CAR B							
44	3: PRICE/FACTOR	8595.725	6767.700	8834.404	MIN	CAR B							
45													
46	4: QUALITY/FACTOR	13.24503	11.33734	12.06460	MIN	CAR B							
47	5: FACTOR/QUALITY	.0755	.0882041	.0828871	MAX	CAR B							

Figure 1.

up to one, or 100 percent. If they don't, go back over your list again and give it some more thought. This is not a speedy step in this decision model, but it's an important one.

The next procedure is to look at each major component to determine if there are additional options within the category. If it's automobiles you're comparing, for example, your primary decision categories might include engine, fuel requirement, and upholstery. You might then break these categories down into four-cylinder, six-cylinder, and eight-cylinder; gasoline and diesel; and cloth, vinyl, and leather.

Not all major components will have suboptions. For example, things like air conditioning or a sun roof may be an available extra but would not have subcategories of their own.

You will need to give each suboption a rating, just as you rated the major categories. Again, the suboption ratings need to total 100 percent. If a category doesn't have any suboptions, then give it a 100 in the column for suboption ratings; in other words, you treat such a category as though it had a single suboption rated at 100 percent.

```
 N        O         P           Q         R
                  CAR C
        PRICE                QUALITY   FACTOR
 ---------------------------------------------
///
///     19950                     4        .6
///
///
///         0                     5       .27
///         0                     0         0
///
///
///         0                     5       .22
///         0                     0         0
///
///
///         0                     1     .0595
///         0                     0         0
///
///
///       650                     4         1
///
///
///       500                     3      .108
///       900                     3      .012
///
///       200                     3       .24
///
///       500                     3       .06
///
///

 ---------------------------------------------
        PRICE     CAR C      QUALITY   FACTOR

        22700                    31    2.5695
                 1881.537
                 732.2581
                 8834.404
```

Some of the features you want may be included in the base price under consideration. Others will have an additional price tag. You'll want to indicate this information in a pricing column. If an option is included in the base price, enter a zero opposite it in this column; otherwise, enter the added cost. Your major components should also include an entry for the basic system under consideration, along with its price.

The next decision variable is a quality rating. Compare each option for each purchase under consideration and indicate with a number from 1 to 5 how well it stacks up against the other purchases under consideration. Give a higher-quality item a higher number; if the option isn't available, enter a quality rating of 0. When you have finished this step, you'll be done with all the input weighting and will be ready to start the calculation phase of your model.

In a column labeled FACTOR, enter the formula

(Rating 1) * (Rating 2) * (Quality)

for each item on your list. This gives you the actual weighted factor for each item on the list.

Next, sum the price column, the quality column, and the factor column. Once you've done this you need only a few more things to help you make the best decision.

Using the sums from price, quality, and factor, you need to know:

1. Price * factor / quality
2. Price / quality
3. Price / factor
4. Quality / factor
5. Factor / quality

At this point you're ready to make a comparison. The winner should be the one that has the maximum dollar value for formulas 1 and 5 and the minimum dollar value for formulas 2, 3, and 4. With a little luck, and if you've given careful thought and effort to the planning of your model, the competition should produce a clear winner.

Before you start entering data into your spreadsheet program, you may want to take a moment to consider how you want everything to look when you're finished. If you want to output some sort of report to present to management or to a group at a meeting, you may want to arrange each possible choice so that it fits on a separate sheet of paper, with your conclusions on another sheet. There are two ways this could be done.

Let's assume for the purpose of this discussion that your decision concerns the purchase of an automobile, and there are three cars in the running (see figure 1). All the titles and labels for the major components and additional options could be repeated down the sheet in three complete sets, with the formulas for your conclusions at the end. This would require a lot of replication in your spreadsheet.

The second possibility is to set up the major components and additional options along with their ratings once at the beginning of the row and then fill in price, quality, and factor information for each of the three cars. Formulas for the conclusions would again be at the end of your sheet, below the individual choice information.

If you go for this second kind of setup, you will want to put your spreadsheet in manual recalculation mode and make sure all calculations have been brought up to date before you print it out. When you're ready for a printout, you can print the summary information first, then print out only enough of the spreadsheet to give you the information on choice A. Delete the columns that contain the price, quality, and factor information for choice A. Then print out enough of the sheet to give you information on choice B; delete the columns specific to choice B, and then print out the remainder of the sheet—which should contain only information pertaining to choice C.

Of course you *did* save this model before you began deleting it to pieces, did you not? ▲

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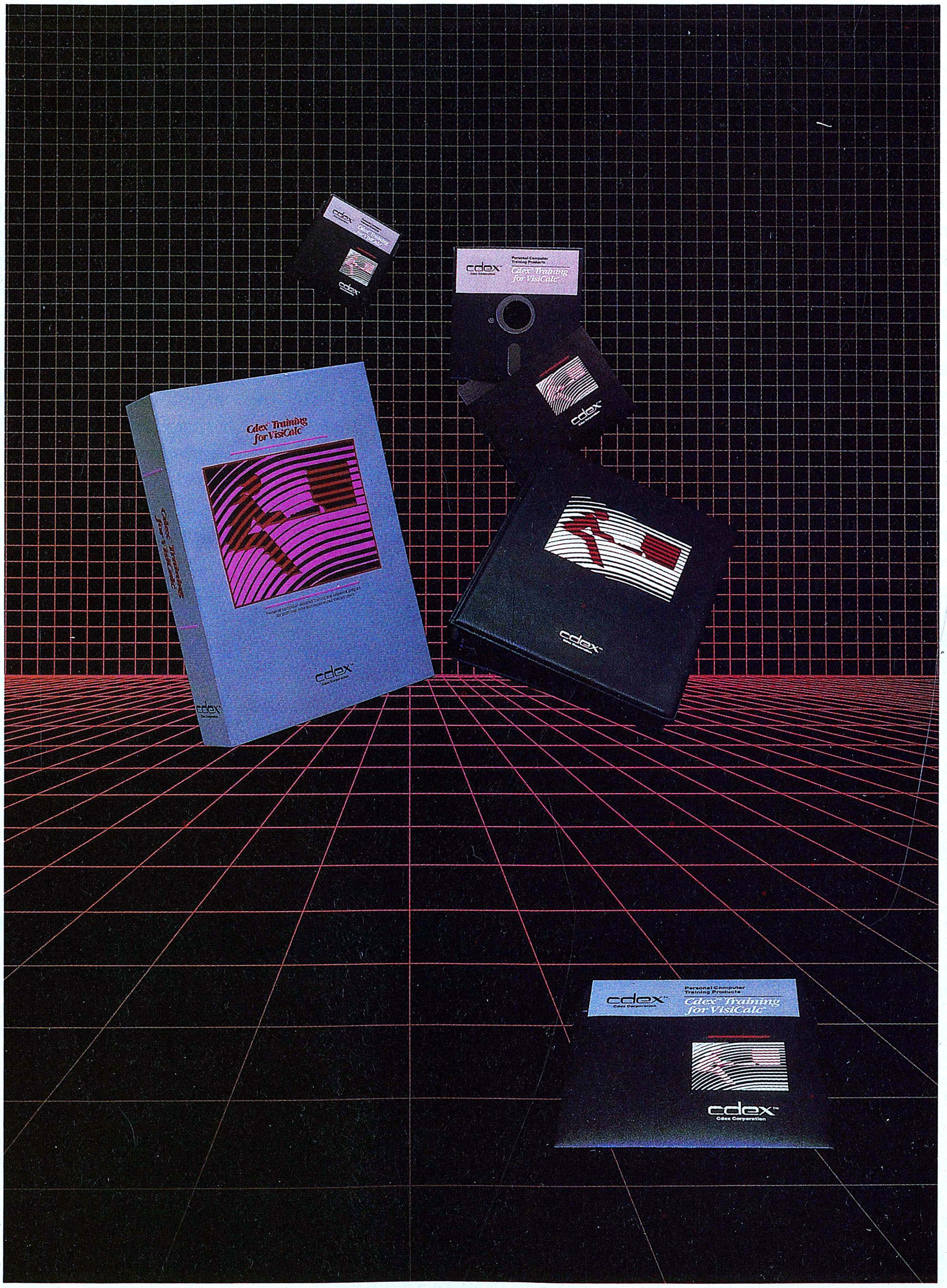
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newspeak

Δ **Combining Post Office and Indy Carriers.** The country's first private post office has opened computerized branches in Ventura and Century City, California.

World Mail Centers, the brainchild of electrical engineer Scott Adler, premiered last year in Camarillo, California. This pilot center combined the full services of the United States Post Office with Federal Express, United Parcel Service, Trans-Pak, Burlington, Purolator, DHL International Overnight Service, and Emery. The couriers regarded the center as an extension of their own systems with no overhead cost to them and made regular pickups.

The Camarillo center generated a quarter of a million dollars in postal revenues in its first six months of operation, netting Adler a good profit on his $60,000 investment and paving the way for a projected three thousand franchised centers over the next five years.

Software engineer Forrest Kendall, who has worked with Adler on missile systems, designed a computer system for the World Mail Center and wrote programs for accounting and courier rate tables. Computers made possible the use of a debit card, replacing cash, identifying the customer, and keeping an ongoing record of all account activity as well as allowing after-hours transactions.

The center works like this: the employee, using a terminal at the counter, prompts the computer to make a generic selection based on where a customer wants a package to go, how fast, and for how much money. It then prints out a mailing label and a receipt, completing the transaction in thirty seconds or less. Profits are made from a 5 percent markup on stamps and a one dollar handling charge for transactions that require paperwork, like registered and certified mail. The system uses Hewlett-Packard's Image database for the management of records and reports.

World Mail Centers will eventually have electronic mail capability, either as a tree structure or from the center's Century City mainframe. If all goes as planned, the centers will become a free-enterprise alternative to the modernization of existing postal services with taxpayers' money and will generate three billion dollars in revenues for the United States Postal Service over the next five years.

Δ **Pursuing Perfect Pasta.** Food scientists at Foremost-McKesson company are using a new noodle to perfect the old noodle at their million-dollar pasta research facility in Dublin, California. The new noodle is their time-sharing piece of a mainframe computer, taking the experimental drudgery out of the never-ending search for the perfect pasta.

Pasta may be little more than wheat and water, but there are thousands of ways that scientists can manipulate those ingredients' interaction during the production process. They can alter proportions, for starters, and vary time and temperature setting for mixing, drying, and pressing routines. In the pasta past, researchers had to proceed step by laborious step in their unsung quest—altering a single variable, recording the result, then moving on to yet another experiment. Now they use a terminal's keyboard and let a General Electric Information Services computer back in Ohio do most of the work.

The brains of the system is a sophisticated Basic program known as *RSM*, for *Response Surface Methodology*. Using sample lab test data for its parameters, *RSM* is able to shuffle one or more production process variables as it runs scores of experiments in the time it would take Mama Celeste to say, "Abondanza." A subprogram with an end-user orientation offers a further enhancement—a model by which to create a people-pleasing pasta. It mixes variables for flavor, color, thickness, viscosity, and that all-important factor, "mouth feel."

"These *RSM* studies won't give us the final answer," cautions Gaylord Palmer, a senior scientist at Foremost-McKesson and *RSM* coauthor. "When we get back into the production facility, we may find different numbers, but the direction, trends, and instructions the program gives us are in the ballpark."

Foremost-McKesson's investment in pasta research is predicated on two market factors—the public's pasta preferences and anticipated industry growth. When it comes to pasta, says company spokesman Bruce A. Lewis, the public knows its own noodle. It covets a pasta that is firm, not

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mushy. It yearns for golden threads that cheerfully hold their own when convenience-minded consumers cook them to death.

Foremost-McKesson is hoping its Dublin research facility will give it the competitive edge in a billion-dollar industry that is expected to triple in size by 1990. Long seen as the principal factor in the girth of Italian opera singers, pasta is now promoted as a fad-cum-health food—no sodium, no salt, no sugar, practically no fat, and, yes, relatively few calories.

"Noodles aren't fattening; it's what you put on them that is," says Lewis.

Δ **Impact of E-Beams Uncertain.** In the short and booming history of the semiconductor industry, technology has paced a succession of quantum leaps. Within the year, semiconductor manufacturers will be offered another state-of-the-art advance.

The technology in question is the E-beam—a very expensive machine that uses beams of electrons aimed through negativelike masks to imprint integrated circuits on wafers of silicon. Heretofore unavailable on a wide scale commercially, these impressive machines will enable semiconductor manufacturers to pack more layers of circuitry (and hence more memory) onto a silicon wafer.

The process of printing integrated circuits using optical techniques, the industry standard to date, is impeded by an effect known as defraction, which causes microscopic lines in the chip's power grid to grow fuzzier the more tightly they're packed. E-beams, which print dot by dot like a television image, trace circuits directly onto a wafer and are not as subject to defraction.

There are two reasons why the semiconductor industry is debating whether to embrace this technological marvel—money and speed. The new machines will cost anywhere from one million to three million dollars per unit compared with today's equipment—optical devices known as steppers and projection aligners that run around $500,000 and $25,000, respectively. In addition, E-beams sacrifice speed for greater precision; they're just plain slower than steppers and aligners.

E-beam manufacturers believe the immediate future of their product lies in sophisticated mainframe circuitry for military and other high-performance systems. It's a growing market and, according to some observers, E-beams could figure in half the semiconductor industry's production by 1990.

"The E-beam's impact on personal computers is further down the road," says Ron Felker, vice president of Electron Beam Corporation of San Diego, California, an affiliate of General Sigma Corporation. His company, one of three that offer the advanced technology commercially, sold its first unit to the navy for a San Diego based computer fabrication facility late in 1982.

"When the industry (as a whole) gets ready to take advantage of the new machine's ability to shrink circuit lines—to pack more and more logic on a chip, more and more cells of memory—then our machines become economical, because you can no longer do it optically."

Other companies banking on commercial acceptance of E-beam technology are GCA Corporation and Varian Associates, which plan to offer their own systems within the year. Their faith in the technology's prospects may hinge in part on the actions of three industry pacesetters—Texas Instruments, IBM, and Hewlett-Packard, each of which has developed inhouse E-beam writers.

Δ **Wall Street Beats the Crunch.** On November 3, 1982, the Dow Jones soared 43.41 points, its biggest gain ever, to a new closing high of 1,065.49. Aside from the emotional boost such a rise gives to stock market participants, the figures are misleading. Cold statistics show that this total would nearly have to triple, soaring to 3,000 to keep up with the cost of living over the last ten years. Market analysts call the recent climbs more psychological events than accurate reflections of the market's health.

Economically accurate or not, there has been plenty of action on Wall Street recently. And all that action requires paper, like last October 7 when 147 million shares were traded, causing proportionate accompanying paperwork.

Avalanches of order tickets have been falling from the Big Board lately in dizzying flurries. Wall Street is able to avoid a crunch of paperwork with the help of computers.

According to the *Wall Street Journal*, there are three computer systems now on the floor of the New York Stock Exchange that are "crucial for managing the current volume." They are:

"The Designated Order Turnaround, or DOT, which routes small orders to the specialist posts on the floor, eliminating the need for floor brokers to represent such orders in the trading crowd.

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When NYSE president John Phelan warned of coming volumes of one hundred million shares a day, a level most people thought unrealistic as recently as the late seventies, more and more Wall Street firms began investing in computer systems to handle the predicted onslaught—a wise investment, as it turned out. The Dow Jones may not be as reliable as it once was, but the new trading levels have Wall Street firms seriously consulting their local computer dealers.

One such firm is Pershing & Company, who spent $25 million on a new system to handle order processing and clearing for the hundred-odd correspondent firms it serves. Today, its vast processing rooms are lined with banks of computers and terminals.

Another firm, Prudential Bache, has improved its services with a GTE system that routes branch office orders to the various exchanges for execution. Until a few years ago, these orders were relayed to New York and routed by clerks. ADP Brokerage Services, which handles accounting for about ninety securities firms, moved into larger quarters to make room for their new computerized accounting system. E. F. Hutton, the investment broker, is installing a central computer system right now. Apparently, when computers talk even E. F. Hutton listens.

Meanwhile, Big Board officials contemplate further improvements in floor operations. Phelan is now talking volumes of 250 million shares, and nobody is doubting him. The one tiny snag in all this computerization is the transaction tape that monitors the trading action on the floor. It's running as much as an hour behind.

It's not a mechanical problem; it's just that people can't read any faster than nine hundred characters a minute. Ironically, the lateness of the ticker tape may now be looked at as a market barometer, a good indicator of activity.

Δ **Taking the Plastic Out of Graphics.** In the field of computer graphics, perhaps the ultimate test of technological sophistication is the ability of the human eye to discern that a computer-generated image was, in fact, generated by a computer.

It usually isn't too difficult to tell. A computer-generated image, though simulated to look exactly like the real thing, will invariably have the appearance of a plastic imitation of the real thing. That problem has now been effectively, licked by Rob Cook of Lucasfilm's computer graphics laboratory in San Rafael, California. Speaking at the Boston Siggraph '82 convention, Cook revealed that the plastic problem is caused by an error in the calculation of an object's reflective properties; in the computer graphics industry to date, "The model that has been used is a really good model for plastic and a really poor model for anything else."

Diffuse reflection—light from a specific source but reflected off a surface equally in all directions—has always been correctly computed as being the same color as the object, while specular reflection—the component representing concentrated highlights, light reflected directly to the eye—has been calculated as being the color of the light source, usually white. In fact, Cook found, "The specular component is usually the color of the material, not the color of the light source."

Computing white spectral reflection for plastic or waxy objects is okay, since such objects, in the real world, always have a transparent or white molecular surface layer. Computing the same reflective properties for a computer-generated, kandy-kolored, tangerine-flaked, streamlined spaceship, is however, a big mistake and would result in the made-by-Mattel effect.

Cook explains that, as all reflection "essentially occurs at the surface," the correct specular components for metals, painted surfaces, and other "homogeneous" objects should be calculated from reference tables of thermophysical spectral data.

The new technique is currently under development at Lucasfilm and was first employed on a limited basis in the creation of the "Genesis effect" for *Star Trek II*.

Δ **Plugging in the Atlas Workstation.** Dolch Logic Instruments has announced its new integrated digital workstation, called Atlas, that combines logic analysis, in-circuit emulation, word generation, and other measurement techniques in one system. Atlas integrates these various digital test methods yet maintains the ability to adapt to individual test environments through the use of plug-ins. Atlas (for *adaptive test and logic analyzer system*) combines a plug-in instrument front end with a CP/M-driven universal computer. Each plug-in module contains the instrument hardware and dedicated software required to perform a specific simulation or measurement task and all plug-ins use the same computer bus control.

When a plug-in is inserted into the Atlas mainframe, its functional software is automatically loaded into the controller. Special function soft keys and flip keys are defined automatically to support the specified test function. Atlas also includes com-

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munications software that allows it to emulate a VT-100 terminal on a Digital PDP-11; the computation and memory capacity of a PDP-11 can be integrated into an Atlas workstation, allowing software compiled on the PDP-11, for example, to be downloaded and debugged locally. Atlas comes standard with two 5¼-inch disk drives used in combination with a Z80A CPU to support the CP/M operating system. The Atlas mainframe is priced around $12,000 with plug-in modules ranging from $2,000 to $10,000, depending on the application.

Δ **"And on That Farm He Had a Computer."** Old MacDonald has entered the information age. Although personal and portable computers have been part of farming for years, their presence is just now being felt on a large scale. No manufacturer is going after this new fertile market with more gusto than Tandy, purveyors of the TRS-80 and owners of the successful Radio Shack chain of electronics stores.

All farms, no matter how small, are businesses, and it has long been predicted that computers would have a significant impact on productivity and information management once farmers warmed up to the idea. With the state of the economy the way it is, farmers are being pushed harder than ever to adapt better means of production and more competitive selling techniques. Up-to-the-minute information about production costs and market prices is essential to the modern farmer's survival. Traditional methods have proven to be slow and frequently unreliable. The promise of instantaneous information waiting at their fingertips has spurred quite a bit of interest among farmers and software publishers, as well as among hardware manufacturers.

Tandy has an agreement with Raintree Publications in Milwaukee, Wisconsin, to sell a videotex system for farmers, called AgriStar, in the thousands of Radio Shack stores across the country. Raintree's Richard Weening, the creator of AgriStar, said in a recent article published in *Barron's*: "Farmers know how to produce, but not how to sell."

AgriStar's main feature is a twelve thousand-page database that includes everything from crop prices to commodity analysts' reports, provided by the Commodity News Service. Up-to-the-minute weather information is provided by NASA. Also available are a shopping service, an electronic mail service, and an online computing farm management program. Of course, you need a computer to take advantage of all these nifty features.

When a farmer goes to a Radio Shack, he has an option. He can buy one of Tandy's computers to run AgriStar or he can lease a dumb terminal for less than four hundred dollars a year. A dumb terminal is only capable of receiving information and is incapable of actual computing functions. Needless to say, Tandy is hoping to sell a few more machines because of AgriStar.

One potential problem that's already been noted about AgriStar is its poor graphics capabilities. Utilizing Prestel, a cost-effective British system for transmitting data, AgriStar will be short on visual presentation of information. According to the *Barron's* article, Weening is not convinced that graphics are all that important. He contends that farmers are more interested in hard facts than in how a healthy corn crop looks.

AgriStar joins the ranks of other ambitious videotex projects such as Canada's Grassroots, which supplies market information from Winnepeg's commodities exchange. Seeing the potential benefit in this kind of system, the Canadian business community is doing its part to cut costs for Grassroots.

In the meantime, the *Bakersfield Californian*, a rural newspaper, is embarking on an ambitious videotex system for farmers in the San Joaquin Valley.

CompuServe has also announced the availability of Farm News Express. Founded by Leonard Timm, a former reporter for the United States Department of Agriculture's daily *Market News*, FNE claims to be the largest database of produce information in the country. Using CompuServe's computer network, FNE distributes information about nineteen city produce markets and thirty growing-area produce markets.

According to Timm, the FNE videotex service is a faster and cheaper way to obtain daily market reports than the USDA's printed *Market News*, which is sent through the regular mail. Timm plans to expand the service to include city and growing-area markets for poultry, grain, and livestock. FNE already includes electronic mail and bulletin board access to enable subscribers to communicate among themselves.

With farm management software pouring into the market and with videotex systems becoming commonplace, farmers now have several ways to seek computer aid in these troubled times. "A computer here and a computer there. . . ." ▲

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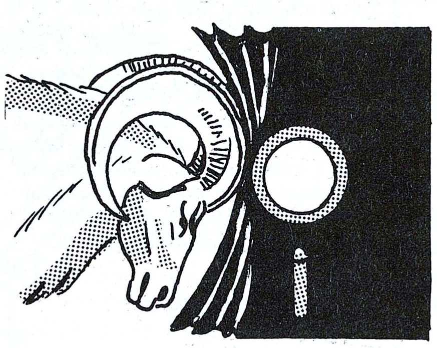

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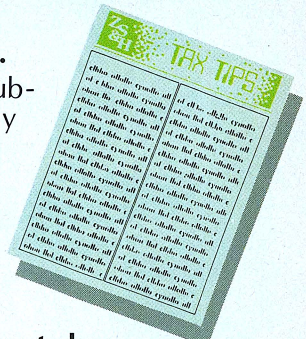

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THE OLD BOY'S

by Matthew Zirkle

So you want to learn UCSD Pascal? Well, how's this for a course description?

The course is taught at the school where the system was conceived and created. The professor headed the project that produced the p-System. Furthermore, the hardware used in the course is a network of forty IBM Personal Computers.

It's EECS 61, offered through the University of California at San Diego's Electrical Engineering and Computer Science department (affectionately known as EECS, as in "eeks"). A required course for all computer science and engineering majors, EECS 61 is also required or recommended for a variety of other majors at UCSD.

The Teaching Plan. When Kenneth Bowles started teaching UCSD Pascal on a Burroughs 7600 in 1976, he chose to use a style of teaching known as the Keller plan, or Personalized System of Instruction (PSI). The Keller plan is a method of instruction whereby the student learns, at his own pace, a unit of subject matter. When the student completes a unit, he must pass a quiz, proving mastery of the material introduced in the unit. If he passes, he may move on to the next unit. If he fails, he must repeat the quiz until he passes it.

Bowles adapted the PSI method to

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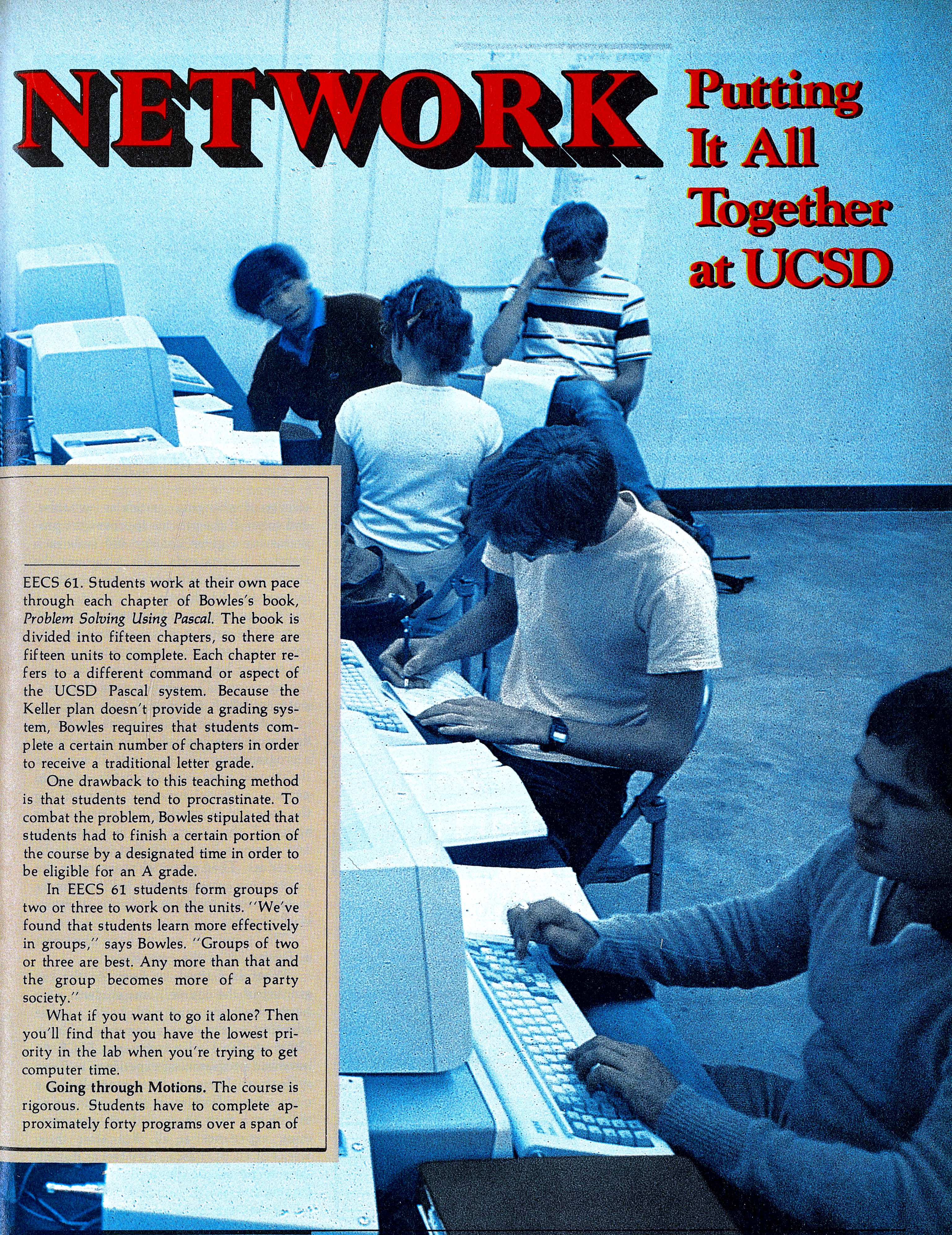


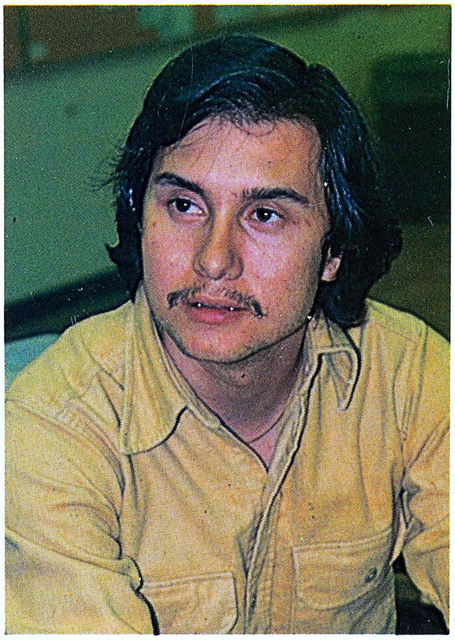
EECS 61. Students work at their own pace through each chapter of Bowles's book, *Problem Solving Using Pascal*. The book is divided into fifteen chapters, so there are fifteen units to complete. Each chapter refers to a different command or aspect of the UCSD Pascal system. Because the Keller plan doesn't provide a grading system, Bowles requires that students complete a certain number of chapters in order to receive a traditional letter grade.

One drawback to this teaching method is that students tend to procrastinate. To combat the problem, Bowles stipulated that students had to finish a certain portion of the course by a designated time in order to be eligible for an A grade.

In EECS 61 students form groups of two or three to work on the units. ''We've found that students learn more effectively in groups,'' says Bowles. ''Groups of two or three are best. Any more than that and the group becomes more of a party society.''

What if you want to go it alone? Then you'll find that you have the lowest priority in the lab when you're trying to get computer time.

Going through Motions. The course is rigorous. Students have to complete approximately forty programs over a span of



Above left: EECS 61 students Mark Squires and Michelle Bourget carry out their assignments on a shared pc. Proctor Allyn Fratkin, right, monitors the students' progress.

ten weeks in order to receive an A. Each program must be completed by the group, with each member having an understanding of how the program functions, if not a part in the engineering of the program itself.

When a group has completed a program, a proctor checks it to see that it's free of bad formatting routines, that it doesn't hang on bad input, and that it yields the correct results. The proctor also looks at the source code of the program and asks questions of each group member—about the working of the various procedures, the effects of changing particular variables, and so on. If the proctor approves the programs for a given chapter and feels each member understands each program, the students go on individually to take their quizzes for the chapter.

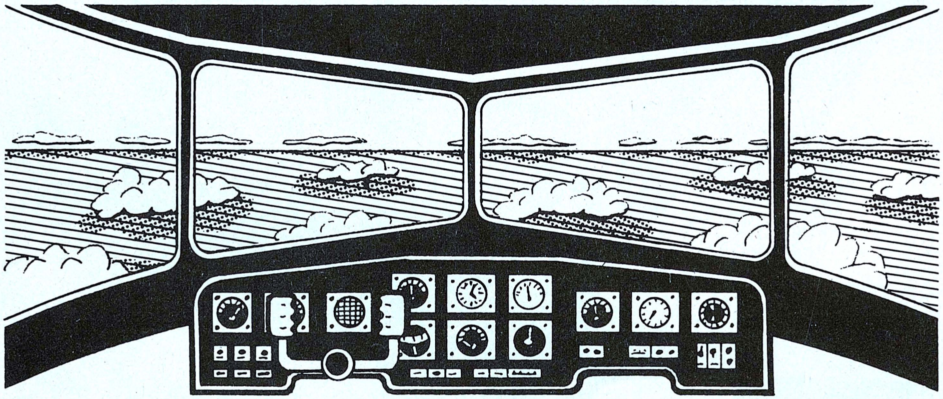
The quizzes are administered on computers. The proctor tells the computer network that a student is ready to take a quiz, the student logs onto a quiz computer (by typing in an I.D. number), and the computer initializes the quiz.

At four stages of the course, each student must take, instead of the regular quiz, a programming quiz or *p-quiz*. In a p-quiz the student must write a Pascal *procedure* to perform a special function. After writing the code and presenting it to a proctor for approval, the student goes to a computer and creates a Pascal *unit* that contains the procedure. Then a special program on the networking system is executed that checks to see if the procedure performs its function correctly.

The p-quizzes are perhaps the most difficult part of the course.

What Is Gained—or Lost. At the beginning of the course, some students who have never programmed have trouble adapting to the way a computer thinks. Other students who come into EECS 61 have had programmng experience in Basic or Fortran. These students generally have even more difficulty in the beginning of the course than those with no programming experience at all. But after three weeks of UCSD Pascal, they feel as though they've never programmed in any other language.

In the first couple of chapters students



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learn how to program simple graphics, using the turtle graphics system in the Pascal library. "This gives the students something they can see and easily understand," says Bowles. After studying graphics, students learn the string functions that are unique to UCSD Pascal.

Recursion, arrays, sets, and records are the next topics. Bowles feels that after covering this material students will have learned all the basic tools needed to program in Pascal. Near the end of the course, students learn about error handling and elementary data structures—including sorting and searching.

What's the toughest subject? EECS 61 student Alan Wetting knows.

"Recursion was the hardest," Wetting says. "You had to keep track of all those variables and their values. Sometimes I had to hold out my fingers just to keep track of where I was."

What Makes It Tick. The EECS 61 course is unique not only in its method of teaching but also in its use of local area networking technology. It runs on the only extensive IBM pc p-System network in existence.

The system, based on Corvus Omninet software, is composed of more than forty IBM Personal Computers and several hard disk drives. Thirty-one of the computers are dedicated to students for writing and editing programs; it's at these machines that the students also submit and complete their homework. Eight machines are used for administering quizzes. The quiz and homework computers are 128K systems with both monochrome and graphics displays.

The rest of the computers are used for support and development of the network. Every unit contains a Corvus Transport Card, which interfaces the computer with the network. Each card has a set of switches that identify every unit by a unique code number, which allows the assignment of each computer to a variety of functions.

For example, one IBM is designed as the printer machine; this computer contains the program that allows a student to dump a file to the Printronix line printer from any computer on the system. Another IBM is assigned the task of being the booker; this one keeps track of all the students' progress records. The system is so flexible that if lots of students need to take quizzes, it can be reconfigured so that fifteen home computers can perform as quiz computers.

At the heart of the system are the ten megabyte Corvus disk drives and two pcs known as the controller and the buffer

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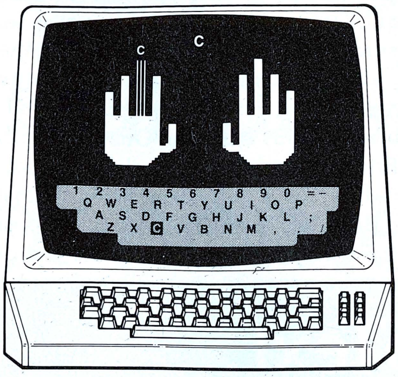
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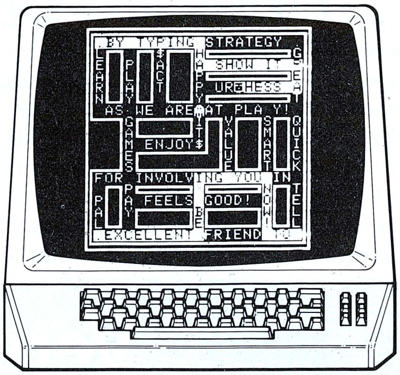

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controller. When the controller is booted up, it goes to the hard disk to read the networking software, the UCSD p-System, and Pascal, loading them into its 576K of RAM.

When a student turns on his computer, a small bootstrap routine is read from the student's floppy disk. This program tells the controller that that person wants access to the network system. This arrangement allows the student to maintain personal working files on his floppy disk, use the p-System software on the network, and avoid the need for buying his own software.

The buffer controller works as a queue for all requests from the various computers on the network. When the controller is ready, it takes the queued commands from the buffer controller and processes them on a first in, first out basis. It sends requested data from its memory or from the Corvus to the appropriate machines. The hard drive contains all the p-System software (accessed solely through the controller), all quiz data, and prewritten text files for the students to modify for their assignments.

Most of the software routines on the networking system were created by former EECS 61 students. One student, Mark Erickson, wrote the only known boot procedure for a p-System network that requires only a small bootstrap program on the student's floppy disk. The rest of the boot is done in the large RAM base in the controller machine. In addition, Erickson and fellow student Robert Rother created many of the low-level machine language routines in the network system that work with the p-System interpreter.

Allyn Fratkin, also an EECS 61 enrollee, wrote the Pascal routines that operate both the controller and the buffer controller. Of course, the compiler and the other p-System and Pascal software are from SofTech Microsystems. In fact, SofTech themselves helped out quite a bit in setting up the EECS 61 lab. The company provided some of the machine language routines needed to interface the p-System with the Corvus hard drives and offered help and advice on other aspects of networking using the p-System.

And what about the rest of the network programs? "We transferred a lot of software straight across from our old Apple network system," says Fratkin. "For instance, Debi Bushman was able to take the Corvus drive on the Apple network that contained the quizzing programs and, with slight modification, use it directly on the new IBM network. This gave us quite a bit more time for setting up the system."

And time was something they needed. The hardware didn't start arriving until the middle of August, a month and a half before the lab opened. It took a little over a month to set up the hardware and get the Omninet system running. The last two weeks before the class started were devoted to making the network software functional and polished. The system wasn't completely functional until eighteen hours before the lab opened.

But the system was put together well. On the first day the network crashed only four times. Bowles said it was one of the smoothest opening days for a new system that he'd seen. Since then the system has proven very reliable.

The End and the Beginning. After students have finished EECS 61, most of them go on to learn systems programming and other aspects of computer operations. Some even become part of the team that's developing the new UCSD Ada compiler.

How do students feel when it's over? One student, Matthew Anderson, has an interesting perspective.

"After all the hard work I had put into the class, I thought that when I finished the last p-quiz, the computer might have played the Hallelujah Chorus or something. Instead, all I got was a message saying, 'Congratulations Anderson, Matthew A.—You passed Quiz #15 for EECS 61.' I would have done it differently."

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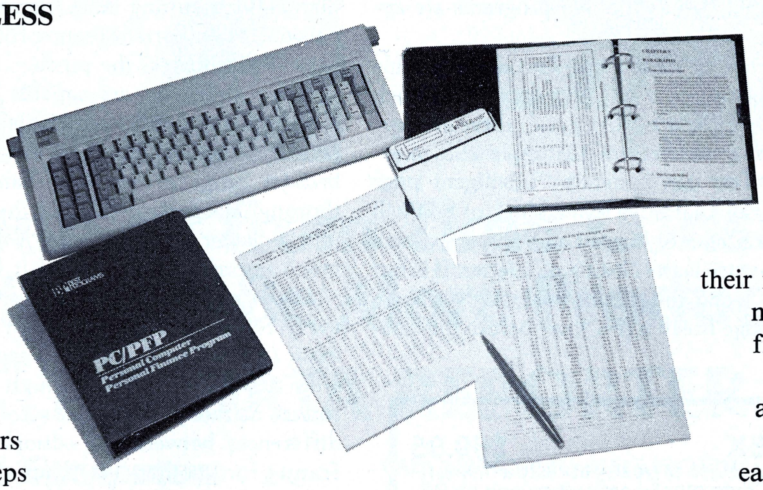

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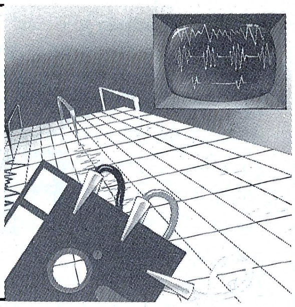

Unless otherwise indicated, software reviewed runs in DOS on machines with either display adapter and requires 64K and at least one disk drive.

PowerText. By David P. Guest. *PowerText* is a sophisticated, powerful program that invites comparison with the best available word processors. It is clearly in the same league as *WordStar,* and feature-by-feature comparisons between the two programs are appropriate and interesting.

There are a few features missing from *PowerText* and available in *WordStar*. Microspace justification is one and on-screen block column manipulation is another. On the other hand, there are several *PowerText* capabilities that are difficult if not impossible to accomplish in *WordStar. PowerText* can generate "intelligent page breaks." This means that one can guarantee that a block of text will appear as desired with a fixed number of lines of additional text on a page. An application of this feature is the closing of a letter. It is not good form to have "Sincerely," and the signature alone on a page, and *PowerText* will force the page break a few lines before the closing to prevent this.

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Multiple line headers with appropriate pagination are possible with *PowerText* and impossible with *WordStar*. Other *PowerText* features that are absent or difficult to accomplish with *WordStar* include automatic document formatting, automatic footnote numbers, form letters with boiler plate capacity, and print macros. *PowerText* is also capable of formatting disks with ten sectors rather than eight, resulting in an increase in usable disk storage. This is a particularly important feature for those with single-sided disks who have begun to feel the pinch.

Both programs are capable of easily producing the standard print enhancements (subscripts, superscripts, underscoring, boldface, for example), although *PowerText* has been implemented for a broader range of printers than *WordStar*. Both programs have thorough documentation, but the *PowerText* manual and tutorial are much clearer than *WordStar*'s (the *PowerText* manual would be much improved, however, if it had included an index).

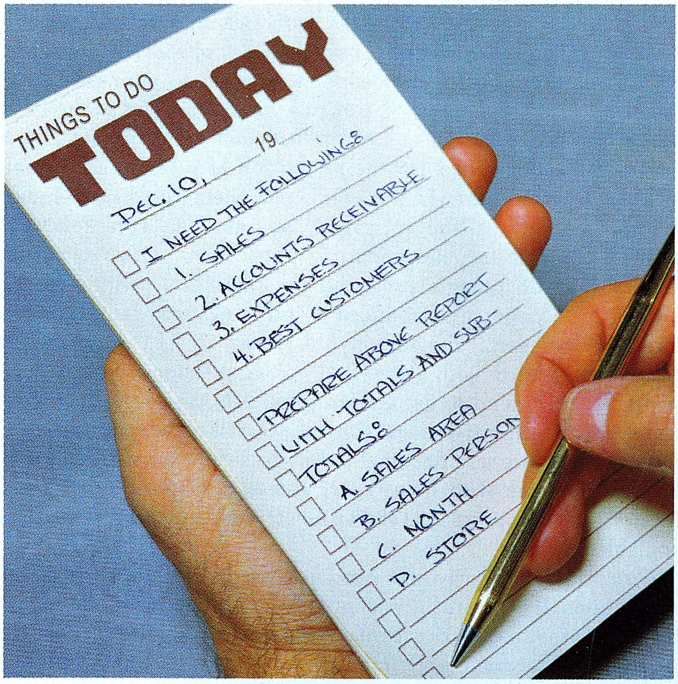
Both programs have superb editing capabilities, with almost every feature one would expect to find in a high-end word processor (block moves, find and replace, writing blocks of text to and from disk, and so on). Although both programs can scroll screen by screen, neither program can scroll printed page by printed page. The differences between the editors involve trading off one desirable feature for another. *WordStar* allows word by word cursor movement, for example, while *PowerText* allows you to "undelete" text you have deleted. The *WordStar* editor calls all functions directly from a single editing modality, while *PowerText* places logically related functions in separate editing modalities (like "insert," "delete," and "jump"). The tradeoff here is that *WordStar* does not appear to force you to engage a modality before gaining access to a function, but the price paid is a complex series of two-character control codes and complicated menus. While *PowerText* requires you to invoke a modality, functions are invoked for the most part with single keystrokes, and a one-line menu is generally a sufficient guide to functions.

Customer support and freedom from defects and bugs are additional areas in which comparisons are fruitful. MicroPro (the company that markets *WordStar*) has an official policy against providing direct help to end users. Beaman Porter (the company that markets *PowerText*), has a prominently displayed phone number in the manual and on the disk sleeves. Calls to this number produce prompt, courteous, and helpful information. If your question cannot be answered immediately, you will frequently find yourself talking directly to the program author.

Bugs and defects are likely to creep into any program as complex as a sophisticated word processor. Although MicroPro has been aware for some time of bugs in *WordStar*, they have announced no plans to make the program perform as specified. Beaman Porter, on the other hand, includes a five-year warranty with *PowerText*. If the program fails to perform as specified in the manual in this time period, it will be fixed at no cost to the user.

Up to this point, it may seem that the choice between *WordStar* and *PowerText* is simple: both programs are enormously impres-

Monday 9:00 am



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sive and sophisticated products with enough capacity to satisfy the most demanding of users; but, feature by feature, *PowerText* has more to offer than *WordStar*. Unfortunately, things are not quite this simple.

The programs have radically different design philosophies. Design philosophies are like religions. They can stir up strong emotions, heated discussions, and persuasive arguments, but genuine conversions are rare. If you believe in one design philosophy, it is unlikely that any amount of argument will convince you that the other is better. Consequently, in the comparison between *WordStar* and *PowerText*, the degree to which the design philosophy matches your own is at least as important as feature-by-feature comparisons between the two programs.

WordStar, like most microcomputer word processors, is screen-oriented. While you won't see underscoring, subscripting, superscripting, and boldface type on your screen, the program attempts to conform to the philosophy of "what you see is what you get." Thus, the text on the screen is a close approximation of the text as it will appear on paper, complete with justification (if invoked), centering, hyphenation, and so on. If you have introduced any complex formatting (like narrowed margins with a change from double to single spacing to indicate an extended quotation, or complex indenting as you might do to produce an outline), the image on your screen will closely resemble the final hard copy.

PowerText makes no pretense at being screen oriented. Although it can be forced into this mode, it is clear that it was not designed to function in this way. When the program is used as intended, text is simply typed in. As long as the textual information is sequentially correct, one need not be concerned with the way the screen looks. Simple formatting is handled with embedded commands (for example, */par* to produce a paragraph, */sal* to produce the salutation in a letter). Parameters that control the entire document and the way the embedded commands function are contained in a "style" file for the document type. Given sequentially correct information, an appropriately formatted final document is produced, no matter how the screen looks at the end of an editing session.

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Thus, the choice between these programs does not reduce to the simple question, "Which one is better?" The appropriate question is "Which of these design philosophies is closer to your own needs and habits?" It seems fair to conclude that *WordStar* is the better choice for the *creation* of and *experimentation* with formats. *PowerText* is the better choice for the *production* of established formats.

PowerText is written in the UCSD p-System (the disk includes a runtime version of the p-System, so you can run *PowerText* from DOS). This fact has important implications for potential purchasers. The documents produced by *PowerText* cannot be read from DOS. Documents produced by other systems cannot be read by *PowerText* even if they are in ASCII format. At this writing, no utility is provided with *PowerText* for conversion of such documents. If you intend to use a word processor to rework documents created outside the p-System, *PowerText* will not be much help. If you intend to prepare documents for electronic transmission there will be problems with *PowerText*, unless a communications program that functions in the p-System environment becomes available.

PowerText is clearly the word processor of choice for certain applications. It is beautifully tailored for high volume production of documents that have strict format requirements. Institutions and organizations that have style manuals or standards for the production of correspondence, memoranda, presentations, and other similar documents will find this program to be ideally suited to their needs. Educational institutions with format requirements for multiple choice examinations, outlines, syllabi and the like will find that such documents are easily and quickly produced with *PowerText*. Scriptwriters who must follow the strict formatting requirements of studios and producers will be well pleased. Making *WordStar* accomplish these tasks with anything like the elegance of *PowerText* would require the additions of *MailMerge*, *JEL*, and *Keynote* to the basic *WordStar* program. The price of this package would be more than twice the price of *PowerText*, and the combination of programs would still be missing many important capabilities standard in *PowerText*.

PowerText, by David P. Guest, Beaman Porter (Pleasant Ridge Road, Harrison, NY 10528; 914-967-3504). $399. For users who already have the UCSD p-System, a version of *PowerText* without the p-System runtime module is available for $199.

Wizardry. By Andrew Greenberg and Robert Woodhead. The Personal Computer has been out for over a year, and people are gradually starting to realize that it can be used for things other than spreadsheets and word processing. Those publishers who have gambled on high-quality adventures have seen them go quickly to the bestseller list. But up to now a title has been conspicuously missing: *Wizardry*, one of the all-time bestselling adventure programs from the Apple. Don't boot up *Wizardry* expecting to play an adventure like *Zork*. It has a lot more in common with role-playing games like *Dungeons & Dragons*. As a matter of fact, it bears a more than coincidental resemblance to that game.

As in *D&D*, you start the game by creating characters. Each character has a name and six characteristics (strength, I.Q., piety, vitality, agility, and luck). The characteristics are represented by numbers that range from one to eighteen. The higher they are, the better; there is no advantage in being weak, stupid, or clumsy. Your character also belongs to one of five races (human, elf, dwarf, gnome, or halfling) and one of three alignments (good, neutral, or evil). You also get to choose a profession for your character, such as fighter, priest, mage, or thief. Each character starts with a number of "gold pieces" that are used to equip him or her with armor and weapons.

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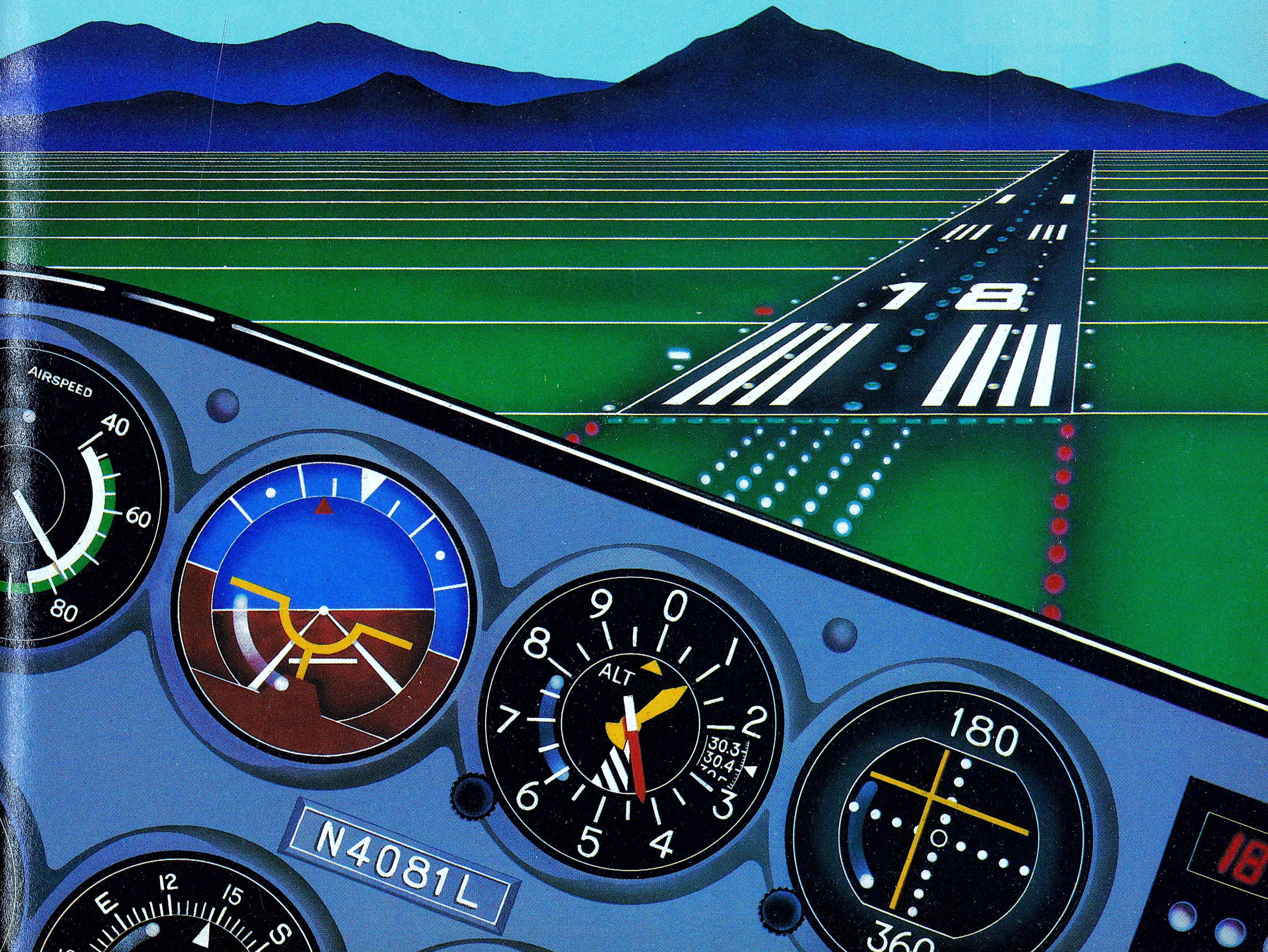

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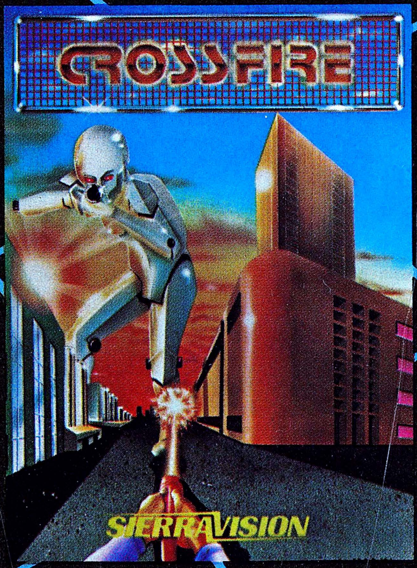

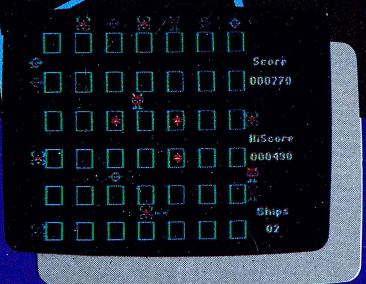
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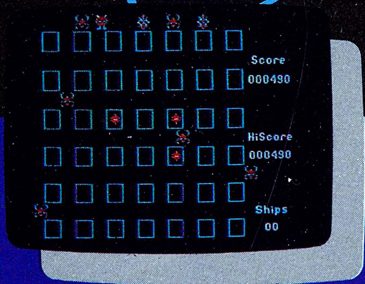
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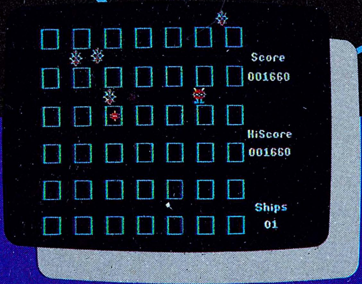
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characters band together in groups of six and go adventuring. Attention must be paid to having a good mix of professions in each group. Fighters, for example, are good at chopping up monsters with their swords, but they don't know any magic. Mages are good at casting spells, but fare poorly in close combat. And combat is what it is all about.

The *Wizardry* disk includes a 3D maze of ten levels. Each level is a separate twenty-by-twenty maze. As you move through the labyrinth, you get a character's-eye view of it with a display that occupies one corner of the screen. The rest of the screen gives such information as character status, spells active, options available, and descriptions of things encountered. When you run into a bunch of monsters (there are lots!), a picture of them is superimposed on the display, and you are given options for each character (fight, cast spells, run away, among others). Having killed the monsters, you receive a certain amount of treasure, perhaps including magic items.

The object of the adventure is to retrieve a precious amulet that an evil wizard (what else?) has stolen and hidden at the bottom of the labyrinth. In the way there are not only monsters, but also dark rooms, pits, curses, one-way doors, magic drainers, and tricks too fiendish to mention. A party of beginning adventurers has no chance of bringing home the trophy, but after repeated adventures, going ever deeper, they will gradually acquire the experience and the equipment they need. If you get through this one, you are ready for sequel adventures the authors are preparing, using the same system.

This is not the best possible implementation of the game. For example, the program uses letter keys for movement, as in the Apple program, instead of arrow keys. On the other hand, it runs faster on the IBM and the graphics have been improved. This game may seem impossibly complex at first, but you will quickly learn why it has become a favorite.

Requires two disk drives and a color adapter. (A version for the monochrome adapter is being prepared.) FJ

Wizardry, by Andrew Greenberg and Robert Woodhead, Sir-tech Software (6 Main Street, Ogdensburg, NY 13669; 315-393-6633). Price to be announced.

The Norton Utilities, by Peter Norton. *The Norton Utilities* are currently composed of four main programs, *Disklook, Secmod, Filehide,* and *Unerase,* and are distributed as a set on three disks. While they may be purchased individually, the buyer who opts for the complete set receives ten additional useful programs. All the programs are menu-driven, all have been upgraded to DOS 1.1, and all employ a similar command structure.

The utilities are written in IBM Pascal; execution, especially of the sorting routines, is at lightning speed. The program set comes with approximately fifty pages of clear, concise documentation, which fits nicely into the DOS binder.

Disklook is a program that tells you everything you ever wanted to know about disk file structure but didn't know how to ask. The program will display a disk's directory, sorted by file name, extension, creation date, size, or attribute. Its most impressive display, however, is a sector use map; this is a graphic representation of all the files on a given disk. You can easily see bad tracks, reserved space, available space, and any sectors of conflicting file space allocation.

Another *Disklook* menu option produces a display, for each file on disk, that includes size in bytes, number of sectors used, creation date and time, file attribute, and starting track and sector numbers. The display also highlights on a disk map the sectors occupied by the file in question, readily showing whether a file occupies contiguous disk space or is spread out over noncontiguous sectors.

Disklook also provides display—in ASCII or hexadecimal format—of any disk sector you care to examine. An option added to the most recent version of the utility cleverly strips the screen of nonprintable characters, allowing you to obtain a rational dump of the screen display by means of the prtsc key. This facility is handy for desktop comparison of hex codes.

The disk containing *Disklook* includes five other utilities, named *Beep, Clear, Diskopt, Bathide,* and *Filefix. Beep* does just that—it beeps, from DOS. It's handy for inclusion in batch files, to keep track of progress or get an operator's attention. *Clear* does from DOS what *cls* does in Basic. *Diskopt* reorders a directory to a more convenient sequence, putting the most used entries at the top of the directory to minimize seek time during processing. *Bathide* is a batch version of *Filehide,* about which more in a moment. It's designed for inclusion in batch files, where one might wish to "unhide" a file for subsequent execution and later "hide" it again to prevent accidental erasure.

Of the extras on the *Disklook* disk, *Filefix* is the most valuable. This routine attempts—usually with success—to repair files that have been damaged through bad tracks or incomplete sectors. The program runs without user intervention and requires no prior knowledge of the file structure.

The second of the four major utilities, *Filehide,* comes on a disk with three bonus utilities: *Filesort, Print,* and *Reverse. Filehide* allows you to control hidden and system file attributes, setting them on or off at will. *Filesort* reorders the directory into various optional sequences (sorted by name, extension, creation date, or size) and rewrites the sorted directory back to disk. *Print* is an ASCII file printing utility that formats files to the printer with date, headings, and page and line numbers. It's easy to use and handy for the quick listings necessary for complete file backup. *Reverse* is a .com file that causes reversal of the screen image; it's useful in batch processing to call attention to certain displays.

The two major programs on disk three are *Secmod* and *Unerase;* the goodies are *Timemark* and *Scratr.*

Secmod, like *Disklook,* is not only a useful tool but an educational one as well. Its primary function is the direct modification of data on specified disk sectors. With this capability, it's possible to

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make custom alterations in otherwise protected software. *Secmod* is not a copy utility; while it might be possible to use it as such, the logistics of reading a disk by individual sector, changing disks, and writing out those individual sectors—repeating that process for each of 320 sectors—make this use of the program unlikely. *Secmod* allows sectors to be changed in either hexadecimal code or the corresponding ASCII. Data is displayed both ways, and the tab key toggles you from one area of display to the other.

Unerase does what the name implies. For some users this may be the most valuable program of the set. The documentation goes into great detail about how to recover what's recoverable from accidentally erased files. *Unerase* is a program that ought to be part of every serious user's library.

Timemark is a .com file that can be used either to display the current time or to calculate elapsed time for any batch processing. It's handy for optimizing long batch runs or for the purpose of charging computer time. *Scratr* allows selection and alteration of screen attributes from batch files. Colors, reverse video, and blinking text are made available by this program for batch routines. **Jo**

The Norton Utilities, by Peter Norton (1716 Main Street, Venice, CA 90291; 213-399-3948). Complete set (fourteen programs), $80. Individually: *Disklook*, $20; *Unerase*, $20; *Filehide*, $10; *Secmod*, $20.

Ken Uston's Professional Blackjack. By Jack Briner. This is a complete toolkit for the serious twenty-one player. The program teaches and coaches three levels of card-counting strategy, from a relatively simple plus/minus count that gives a player a miniscule theoretical advantage to the powerful (and difficult) Uston Advanced Point Count, whose practitioners enjoy an edge of about 2 percent over the house. In addition to these counting games, the program also offers training in basic (noncounting) strategy; mastery of basic strategy will give you virtually even chances in single-deck play.

The counting strategies are based on Ken Uston's book *Million Dollar Blackjack*. Uston, probably the best known (most notorious?) blackjack player and writer, holds a copyright on these systems and has given his blessing to this program and its documentation. The latter, incidentally, is a forty-seven-page condensation of Uston's somewhat labyrinthine treatise. Both the text and the accompanying lavish color charts are distinct improvements over the original; some players may find the charts alone to be worth the price of the program.

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In play mode, *Professional Blackjack* is keyed to named casinos. The most prominent casinos of Nevada and New Jersey are served up on a menu; if your favorite spot isn't there, you can add it. Rules variations for the various casinos are based on information that was current at the time the program was written, but since casinos like to change their rules from time to time, you may edit that information on the program. You can even design your own fantasy casino, with rules much more favorable than those offered by any real locale, and perform a little what-if analysis.

The table accommodates seven players, each of whom may be either user-controlled or computer-controlled. Each player can select either basic strategy or any of the Uston strategies. The program remembers which strategy each player has selected and prompts accordingly.

A toggle on the main menu provides, if you want it, a running report of the status of the cards and an indication of the appropriate play for each hand you're dealt. If you're using a color monitor, you'll find these strategy prompts are keyed to the color charts in the documentation. You can also switch on or off a set of aural cues that signal misplay: one kind of beep if you bet too little, another if you bet too high, and a third if your play of the hand is not correct according to the strategy you've picked.

The program's drill mode may well be the most useful feature for a person struggling to master one of the Uston systems. Here you have two main options. The first is a countdown routine that simply tests your ability to track the status of the deck. You govern the speed of the dealer, and the program records the number of seconds it takes you to get through the deck. The other drill option throws hands at you in apparently random sequence, displays the count of the deck, and asks for your play. The hands selected for this drill are not routine, obvious ones, but borderline cases; you could play a normal game for hours and not see more than a couple of these difficult hands, yet knowing what to do in such exceptional circumstances can make the difference between winning and losing in real action. **CS**

Ken Uston's Professional Blackjack, by Jack Briner, Intelligent Statements (Box 2602, Chapel Hill, NC 27514; 919-942-0008). $89.95.

The Optimizer. This program can help you and your firm find optimal solutions to business and manufacturing problems, including product pricing, materials requirement planning, production scheduling, resource allocation, and personnel assignment. Farmers will use it to create a least-cost high-protein mix for their pigs, and oil barons to get the most in profits from a night's run through an oil-cracking plant.

The Optimizer yields more than a simple yes or no answer. Its detailed output will direct your attention to nonprofitable items and slack quantities. Its estimates of the profit and loss effects of modifying constraints (for example, increasing your total advertising budget) can help you and your firm make major policy decisions.

The Optimizer is based on Dantzig's linear programming algorithm. This algorithm is an iterative procedure used to maximize or minimize some desired result (objective function), subject to a series of linear constraints. *The Optimizer* makes it easy to put theory into practice. It's accompanied by an excellent manual, lots of examples, and sample files dealing with production, workload allocation, warehousing, transportation, and investment, along with clear-cut descriptions of both general and specific procedures.

Data entry is difficult. It is on a value-by-value rather than on a function-by-function basis. After the values are entered, there is no way to go back and correct or change them without running the problem and repeating the cycle.

File control is good; it is easy to store your models on disk to be retrieved and updated as constraints and constants change. The program is flexible. You can search for either a maximum or a minimum, and you can easily modify both constraints and objectives to explore a variety of "what-if" scenarios.

Your results can be displayed on the CRT or sent to the printer. But you are limited to eighty columns and the wrap-around display can be extremely confusing.

The Optimizer's algorithms are robust. Neither trivial errors in setting up a problem nor mathematical degeneracies will faze it. If you inadvertently enter the same set of equations twice in different form (easy to do when there are a large number of constraints), the program will find the solution anyway. If there are multiple solutions, it will let you know the values of all extreme points. And it will flag redundant or inconsistent sets of equations.

By contrast, *The Optimizer*'s own internal error trapping is extremely poor. In one case in our tests, the printer was out of paper. Rather than trap the error and continue with an appropriate error message, *The Optimizer* exited to Basic and trashed all the data that had been entered.

The Optimizer requires only 48K. But it is limited to problems with ten or fewer decision variables and ten or fewer constraints. These limitations may be appropriate for small, less powerful computers. They aren't adequate when the pc's extended memory capacity is taken into consideration. pg

The Optimizer, SuperSoft (Box 1628, Champaign, IL 61820; 217-359-2112). $200.

Executive Suite. Playing adventure games these days can be lots of fun and excitement, but do these games reflect any aspect of real life? Well, *Executive Suite* gives you the opportunity to fight your way up the corporate ladder rather than thinking your way past dragons (although you may very well wish you were fighting dragons rather than your corporate rivals).

In *Executive Suite*, you'll have to keep your wits about you and make tough decisions that will affect your business and personal life as you vie for higher paying positions with Mighty Microcomputer Corporation. What will you do when Malcolm Farmsworth III (President of MMC) storms into your office demanding to know why his pet project hasn't been completed on schedule? What response will you give to Joyce Stern (VP of Administration), who suggests a decidedly nonbusiness tryst after work?

As you work your way up the corporate ladder, you'll be faced with harder decisions and seemingly insurmountable problems. Unlike most adventure games, this one gives you a set number of actions—in the form of a multiple-choice menu—to take in reponse to the situations that arise. In some instances, none of the choices seems right and you must choose the least of the evils. Every response you give will be remembered in your end-of-term review, and your performance will be judged. Good performance often leads to better job opportunities, average performance leads to fair (usually similar pay level) opportunities, and poor performance leads (usually) to poorer job opportunities. Some mistakes made in your career are easily forgotten; others will stay with you forever.

You start playing *Executive Suite* by filling out an application in the personnel office, which will be filed and can be updated as you progress to higher positions at MMC. In the event you need to stop playing and come back to the game later, a simple press of a function key can handle it for you.

Clever use of the IBM character sets allows viewing of pictures, illustrations, and business letters displayed throughout the game on either a monochrome or color display; the program would benefit from even more of the illustrations, as they add an agreeable break from the numerous multiple-choice screens. (As it stands now, illustrations are drawn only in the very beginning and ending of the game.)

Be prepared for fun and surprises when playing *Executive Suite*. And remember to bring your towel. rk

Executive Suite, Armonk (610 Newport Center Drive, Suite 955, Newport Beach, CA 92660; 714-760-3955). $39.95.

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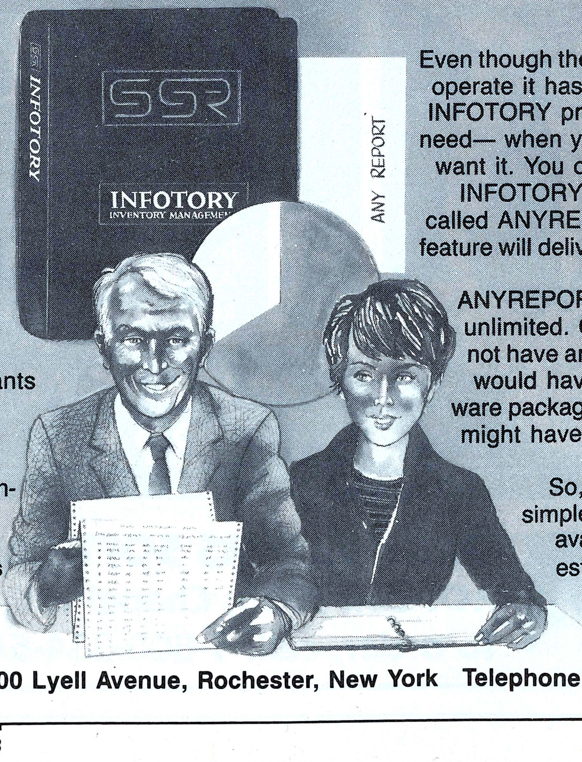

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Bug Off. Reach for the Raid! The bugs are coming! Millipedes come winding down the screen. Ladybugs sashay back and forth. Spiders scuttle around on the lower levels, and ticks drop down on you from nowhere. To fend off these chitinous invaders you have a zapper firing from the bottom of the screen.

Yes, this is a pc adaptation of *Centipede*, complete with mushrooms. It is not as fast as the original, but it does not lack for color and thrills. It can be played with either a keyboard or a joystick; the keyboard option is slower but gives better control.

The millipedes travel in a column, as in the original game. Shooting one breaks up the column. If the millipedes make it to the bottom, they just stay there, moving back and forth, and making things difficult for your zapper. Ladybugs move slowly across the screen and turn into millipedes if they make it to the other side. Spiders crawl randomly around the bottom of the screen, threatening your zapper with every move. Worst of all are the ticks. It takes guts to shoot at them since you have to sit directly in their path to do so. If you miss, you're dead; and if you avoid them, they turn into millipedes and come looking for you.

Each of these crawlies has a certain point value that is multiplied by the level (there are fifteen) and added to your score. No running up a high score on the first level! Every three levels conquered adds 2,000 bonus points and an extra zapper. You can start the game at any level, but you will miss out on bonuses if you bypass the lower levels. It is also possible to kill the sound. That makes the game less exciting but may make you more popular with your neighbors.

Bug Off will take no prizes for animation, but it does fill an important niche. Requires 48K and color adapter. fj

Bug Off, Bella Software (Suite 500, Citizens Bank Building, Richardson, TX 75080; 214-238-5436). $34.95.

DOSCPM. This is a utility program that converts PC-DOS files into the CP/M-86 disk format. *DOSCPM* is fast and reliable, and it incorporates excellent error handling. The program can be used to transfer whole sets of files in a single operation. For example, the command *doscpm b:\*.doc a:* transfers all files with extension .doc from your DOS disk in drive B to your CP/M-86 disk in drive A.

Six pages of documentation cover the necessary ground adequately and are properly sized to fit into the IBM manual. Note that although DOS programs can easily be moved onto a CP/M-86 disk they cannot be executed, because of differences in operating system service call conventions. rd

DOSCPM, by Adaptive Computer Systems (Box 280B, Wheeling, IL 60090). $50.

The Instructor. This is a simple and cheerful little tutorial program on how to use the IBM pc without having to know anything about computers. It shows the functions of the keyboard, function keys, and numeric keypad in a series of exercises and games. You can see how to backspace, cap, use the spacebar, tab, and use the control key to break, pause, or reset. You can also make a printout. You can play the maze game *Cursor Man* to learn how the keypad works. You also get a lesson in the use of the insert and delete keys.

All in all, it's about thirty minutes of familiarity with the keyboard with enough humor to make it fun. An on-screen dictionary of computer terms and a reference guide to Basic and DOS functions are included.

However, *The Instructor* is not recommended for home use by a new computer owner. It simply costs too much for what it does. It might be a good buy for schools or an office where one copy could serve eight to eighty people getting to know their pcs. mf

The Instructor, Individual Software (24 Spinnaker Place, Redwood City, CA 94065; 415-591-4166). $44.95.

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Crossfire, by Jay Sullivan. The next time your friend with an Apple taunts you by saying there aren't any quality arcade games for the pc, you'll have an answer: *Crossfire* is here. Never mind the fact that it's also been *there* (on the Apple) for over a year; the point is that we pc owners finally have an arcade game that's graphically interesting and that won't grow tiresome in two weeks.

Crossfire sets you in a roving cannon on a grid of city streets. You can move your gun in any of four directions—up, down, right, and left—and you can fire it in any of those directions. The creatures who seek your demise are coming at you from every which way along this grid, and they're intelligent enough to know where you are. They too can fire in four directions, and they do quite a bit of that—sometimes at random, more often with deadly purposefulness. Your job, of course, is to clear the streets.

There are about a dozen of these villains at the start of each round. When you shoot one, it undergoes reincarnation and comes back at you. You have to kill each one four times before it stays killed. Naturally as soon as you wipe them all out, there's a fresh army of baddies to deal with.

You score in two ways. You get a small number of points every time you knock off one of your attackers; you get considerably more for picking up the trophies that appear in the streets from time to time. These bonuses appear and disappear in a manner keyed to the number of shots you fire; when a trophy is available, you have to dodge the bullets and go get it quick.

You also have to scurry around the grid and reload your gun from time to time. The location of the ammo dump is dependent upon where you are at the time you run out; unless you spend most of your time in the center of the board (where you're most vulnerable to attacks from all sides), you'll find yourself frequently having to travel all the way across town to reload.

What makes *Crossfire* so engrossing is that it requires the integration of several different skills. You move your gun along the streets with four fingers of your right hand (the i, j, k, and l keys control the four directions, while the space bar stops your movement). Just learning to navigate successfully takes a while. Meanwhile you have to learn to shoot while you're moving; you do that with four keys in your left hand. Finally, you have to learn to see what's going on. This may be the biggest trick of all, because you have to see the whole screen at once and react instantly to so many different kinds of threats.

When you really get the hang of this, you'll find yourself doing things instinctively without even knowing why you did them. And that, more than anything else, is what accounts for *Crossfire*'s enduring appeal. It's exhilarating to survive not only by your wits, but by your guts and reflexes as well. cs

Crossfire, by Jay Sullivan, Sierra On-Line (36575 Mudge Ranch Road, Coarsegold, CA 93614; 800-344-7448). Keyboard or joystick. Requires color/graphics adapter. $29.95.

NECPrint. By Hal Varian. This program, billed as a "small text editor," fills a software void between the pc and the NEC 8023A printer. Until now, most printer programs have been Epson oriented. The NEC, however, has growing support; this $25 program may boost that support.

Like the Epson, the NEC is governed by control strings. Unfortunately, the NEC strings are different from the Epson strings, and the NEC manual assumes you are using a NEC PC-8000 computer. Even worse, the NEC manual is a masterpiece of user-hostility.

But all's not lost. *NECPrint* simplifies your printing tasks with a menu of printer set-up and text formatting options. Text can be centered, underlined, numbered, and paginated. Margins can be set, file names and dates can become page headers. Superscripting and subscripting are possible, and the full range of type fonts, from enlarged pica to condensed proportional, can easily be chosen.

NECPrint is more accurately described as a text formatter than as a text editor. You create files with Edlin or any other ASCII editor or word processor. One way to use *NECPrint*, then, is to embed in your text format codes that are subsequently recognized by *NECPrint*.

Format codes aren't necessary, though. If you're concerned only with choosing type styles, numbering pages, or setting margins, just load Basic, run *NECPrint*, make your choices from *NECPrint*'s menu, and print your file. It's that easy.

NECPrint is also a worthy teaching aid. Written in Disk Basic, the program uses long variable names, a clear top-down structure, and lots of remarks. Intrepid programmers can easily add new functions.

Also on the *NECPrint* disk is a text file that explains the program and doubles as an example of how to use the format codes. This is all the instruction you get; it should be enough.

A final touch: on the disk label is a toll-free number for technical assistance. dc

NECPrint, by Hal Varian, Aegis Systems (202 West Bennett Street, Saline, MI 48176; 800-521-0521). $25.

Print-It. By Don Mauldin. This is a set of six utility programs that can transfer a text or graphics image from your video display to an Epson printer equipped with the Graftrax option. The distribution disk includes low and high speed versions of three different dump formats: normal size upright, normal size rotated, and double size upright. When you select one of the print modules, it becomes resident in RAM and is invisible to other application software. Depending on the version, between 2K and 4K of memory is made unavailable for use by other programs. Once the utility is loaded, a screen dump can be triggered at any time by hitting shift-prtsc. The product is efficient and accurate; proportions and shadings of the video images are faithfully rendered. rd

Print-It, by Don Mauldin, M.A.P. Systems (1120 NASDA Road One, Suite 444, Houston, TX 77058; 713-333-9640). $44.95.

Snack Attack II. By Michael Abrash and Dan Illowsky. "You've got it again! First that empty feeling; then the pangs. Finally, you hear it . . . Grr . . . You're having a Snack Attack. Your only cure is to gobble up as many gumdrops as you can grab away from the greedy gumdrop guards."

To their credit, the authors did not name this game *Snack Man* or *Pac Attack*. But the effect is much the same. You control a cute, fishy-looking critter trying to navigate a maze and devour dots. Four familiar monsters pursue you. (Actually, it would be hard to create monsters less horrifying than these hapless muppets.)

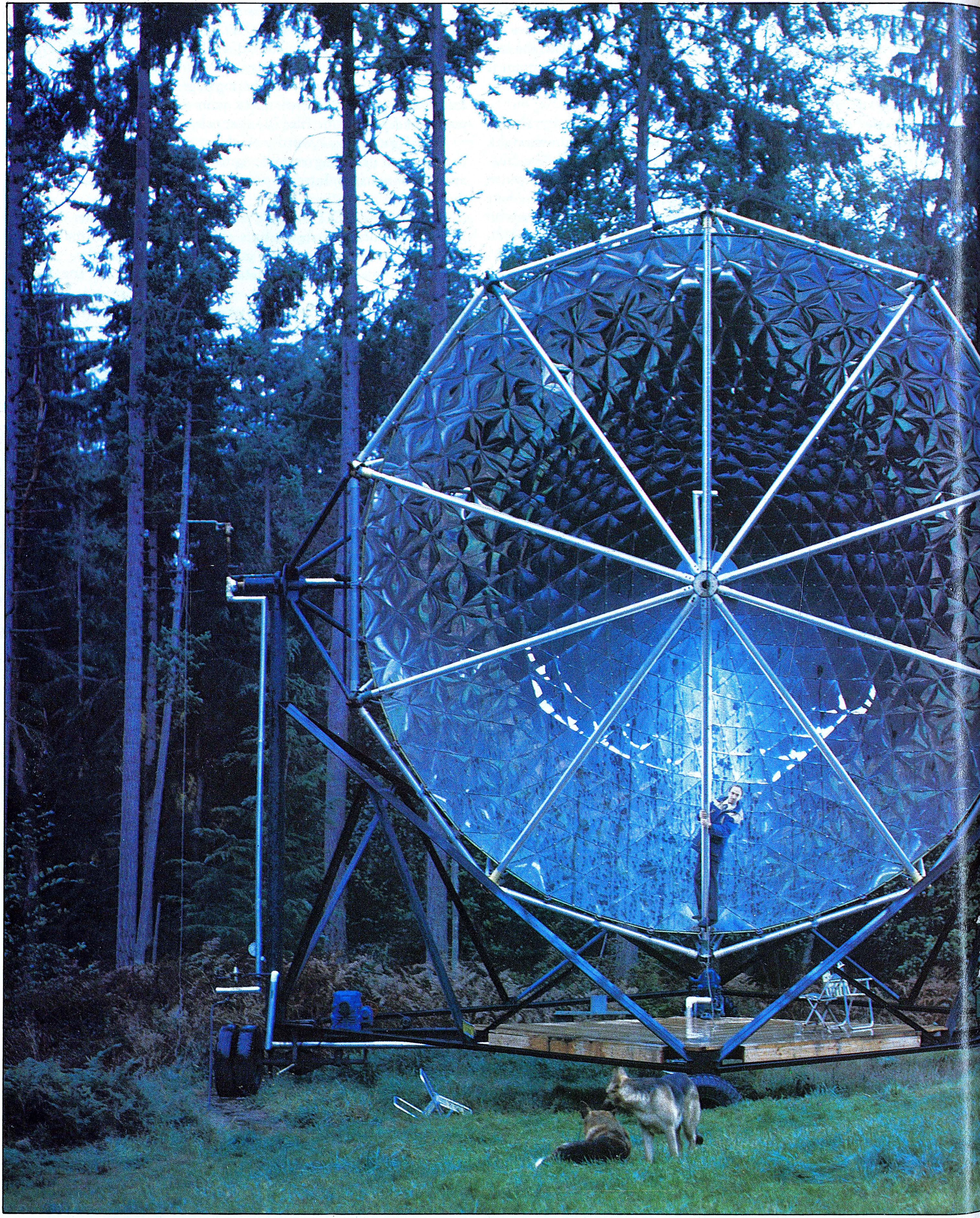
Near each corner of the maze is an energizer. Gobble that and your fish takes on a shark-like appearance, and it can start eating monsters instead of running from them. Once in a while, an apple appears near the center of the screen. If you eat that, you'll zip around at twice your normal speed. Eat both of them—energizer and apple—in close sequence, and you stand a good chance of munching all the monsters, racking up 150 points in short order.

Having cleared out one maze, you suddenly find yourself in another. There are three maze patterns. Each has its own eccentricities. For example, there are some doors (displayed in gray) that your fish can pass through, but the monsters cannot. Other doors, marked in purple, can be used by the monsters, but not the fish.

The authors did a lot of things right with this program. There are six levels of difficulty, and high scores are saved separately for each level. The animation is smooth. The sound can be turned off. There is a pause feature, in case the phone rings just as you're about to break the high score. The control keys can be adjusted to your comfort, though for some reason the arrow keys cannot be chosen.

Those who play one game of *Snack Attack II* will soon be hungry for another. FJ

Snack Attack II, by Michael Abrash and Dan Illowsky, Funtastic (5-12 Wilde Avenue, Drexel Hill, PA 19026; 215-622-5716). Keyboard or joystick. Requires color/graphics adapter. $38.95. ▲



THE PC DESIGNS A SUN HARVESTER

by Michael Ferris

> *"WHAT IS IT ALL BUT A TROUBLE OF ANTS IN THE GLEAM OF A MILLION MILLION OF SUNS?"*
>
> —TENNYSON

As you read this, Doug Wood is programming late nights in the bell tower of the renovated Old City Hall building in downtown Tacoma, Washington. In a room directly under the eight brass bells, Wood is using his pc and points-in-space geometry to ring in some improvements on his patented deep dish sun collector.

It will take him about ten days to type in eight design programs (originally created on mainframe), ten days to make them pc-compatible, and twenty days to trace the programs and determine what each one does; it's been a while since these programs were written.

"It would take fifty engineers fifty years to do the work I'm doing right now," says Wood. It will then take three days to run the programs. All eight must be run sequentially; the final program holds the answer.

The object of all this number-crunching is the verification of the optics involved in Wood's original design of the dish. He will literally reinvent the dish, point by point, variable by variable. When the design programs and supporting calculations are correct, he will plot the results and make blueprints for construction of the sun collector.

Then the young designer will spend approximately forty-three more days discretely making second-generation improvements, one change at a time.

Dishing Out Solar Steam. The "backyard" prototype of Wood's invention, the parabolic reflector, is the showpiece of his company,

Above: Solar power mirror designer Doug Wood poses with his creation. Left: Wood's original, thirty-foot mirror does its thing at his Washington location.

Solar Steam. The company's plans to market the device in knockdown kits with blueprints and instructions, starting in late 1983, put Solar Steam on the cutting edge of solar technology. At $15,000 each, the thirty-foot-in-diameter glass mirror and aluminum-frame dishes will make energy from the sun "a practical reality and cost effective with existing energy resources," according to company president George Jay.

Wood's parabolic dish is amazingly simple. An electric eye and a small motor, located at the base of one of the tripods, are used to track the sun. The black boiler, mounted at the center of the dish, glows from the focused sun rays like the mantel in a gas-fired lantern. Water is pumped through the boiler, and the resulting steam is vented through a pipe.

The three-ton dish, as now designed, can be assembled from existing materials cut into premeasured parts. No paint, plastics, or plating is used. Installation requires ninety man-hours of unskilled labor; no cranes are required.

Each dish delivers 150,000 BTUs per hour, or 300 million BTUs per year—the annual equivalent of 2,000 gallons of fuel oil, 87,000 kilowatt-hours of electricity, or 300,000 cubic feet of natural gas. That's enough energy to run about eight homes for a year. "You wouldn't want to buy one for your back yard, but it would be great for a small ranch somewhere," says Wood.

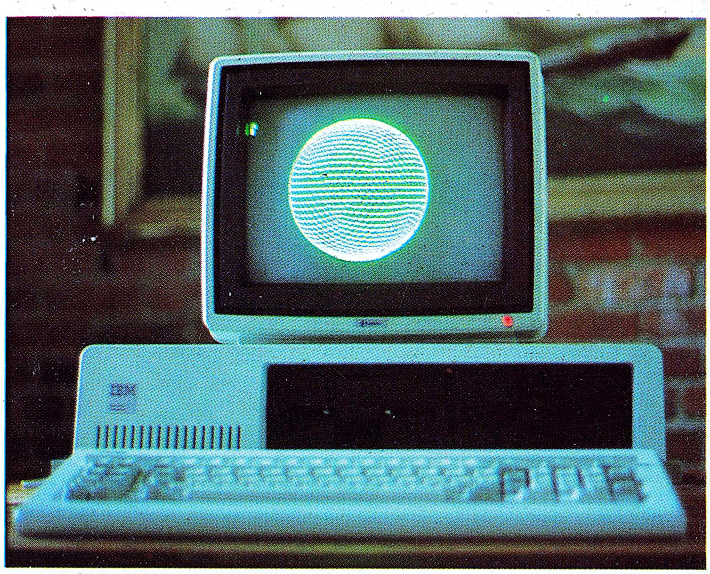
Parabolic Problem Solver. But first, a little fine tuning. Wood details some of the interactive designing he will be tackling on his IBM as company director of research:

Designing a new aluminum post support carriage that can reduce the system's overall cost.

Devising a multi-dish system layout. "We're looking to link a thousand dishes together to one generator."

Measuring the shading of the dishes in a cluster to optimize land use in a multi-dish installation.

Doing stress analysis to see how the dish will hold up "in a hurricane or under a snow load when it gets out in the real world."



Wood's Personal Computer displays its graphics capability, running his geodesic design program.

Computing land cost for a dish farm, using accounting and word processing, as well as figuring the amount of energy lost from shading.

"A parabolic dish could deliver the highest achievable temperature on the surface of the planet, except for a nuclear reactor," Wood explains. "About 5,500 degrees Fahrenheit. Of course, it would melt almost everything known to man." Solar Steam's dish is capable of venting steam as hot as 750 degrees. Most thermal users, however, don't need that much heat. Over half of them require temperatures below 350 degrees.

"THERE STONES LIKE WATER BOIL; ON ALL THE SCORCHING RAINS FOREVER FALL."

—LOMONOSOV

The earliest reflectors, made by the Greeks, Romans, and Chinese, were fashioned from flat pieces of polished metal joined to form a curve or a sphere. Legend has it that the Greek mathematician Archimedes used just such a device to sink Roman ships in 212 B.C. His solar ray machine was based on the work of Dositheius, a fellow mathematician.

The papers of Dositheius were shuffled through history to the Arabs, where they were "rediscovered" by the English scientist Roger Bacon in the thirteenth century. Bacon advised the Pope that a holy war could be won with parabolas made big enough to burn weapons, camps, and cities. Although the idea of solar destruction was popular historically, the Pope didn't pick up on it. Bacon was thrown in the dungeon years later and solar energy curled up with him.

Sona Parabolisa. Solar energy was not to see light again until 1515, when its peaceful use was popularized by the Italian artist and inventor Leonardo da Vinci. Da Vinci proposed a parabolic mirror four miles across that would be capable of generating heat and power for industry. A little unwieldy perhaps, but no need to close up shop.

Late in the nineteenth century, steam was successfully produced from a boiler set in a conical reflector that followed the sun. It was the work of a Frenchman, Augustin Mouchot, in 1866. Ten years later, Mouchot was sent to Algeria to make cooking, distilling, and pumping practical. There he built a mirror, said to be the largest in the world. It pumped 500 gallons of water an hour. He also made ice with this mirror, by hooking it to a heat-powered refrigeration device. Mouchot's mirror never saw commercial use, however. The price of coal had fallen in France and that was that for

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solar power in the land where the Sun King once had ruled.

Over in America in 1888, John Ericsson, designer of the iron battleship, the *Monitor*, set out to prove that solar energy was economical. He claimed that "owners of the sun-burnt lands on the Pacific coast" could consider the "grand scheme of irrigation by means of sun power." His passion for secrecy did the idea in, however, and plans for his "perfected solar motor" were buried with him when he died.

A coal strike in America during the winter of 1902 brought the solar alternative out to shine once again. Aubry Eneas developed a reflector that pumped 1,400 gallons of water per minute, enough to irrigate 300 acres of citrus trees. A slight hitch: it cost twice as much per horsepower as a conventional steam plant. A windstorm toppled his machine—and his newly formed Solar Motor Company with it.

After studying the work of Mouchot, Ericsson, and Eneas, an entrepreneur named Frank Shuman thought he saw where all the others had gone wrong. In 1906 he persuaded investors to back his Sun Power Company—home of the new, low-temperature solar engine that wasted less of the sun's juice.

He chose Egypt for the largest solar plant ever built because labor was cheap there and the sun was strong. Shuman constructed a parabolic trough reflector with five line-focus cylinders, each 204 feet long and thirteen feet wide, that heated up pipes running through them. The collectors produced fifty-five horsepower, energy sufficient to pump 6,000 gallons per minute at an efficiency rate of 40 percent. Shuman's plant would save the Egyptians more than $2,000 a year compared to the cost of coal. Offers poured in for more reflectors, to be built all over the world.

A commercial success—and it took only twenty centuries.

20,000 Square Miles under the Sun. Shuman hoped to build 20,250 square miles of reflectors in the Sahara, giving the world "in perpetuity the 270 million horsepower per year required to equal all the fuel mined in 1909." His dream was drowned by the development of plentiful oil resources in the Middle East, oil that kept nations fighting World War I.

As history shows, parabolic sun reflectors are not a new idea. What's new is the ability to make them work on a practical, cost-effective basis.

> *"HE HAD BEEN EIGHT YEARS UPON A PROJECT FOR EXTRACTING SUN-BEAMS OUT OF CUCUMBERS. . . ."*
>
> —SWIFT

Inventor Wood's dreaming on the sun began as an eighth-grader's idea for a new energy resource. The dream broke the surface of reality in the outback of Australia in 1971. He was twenty at the time, on a working holiday. He noticed "ranches down there run on diesel generators or windmills. They were too far away to be connected to the main electrical lines. What they really needed was. . . ."

He began designing. Suddenly his eighth-grade idea had real-world applications.

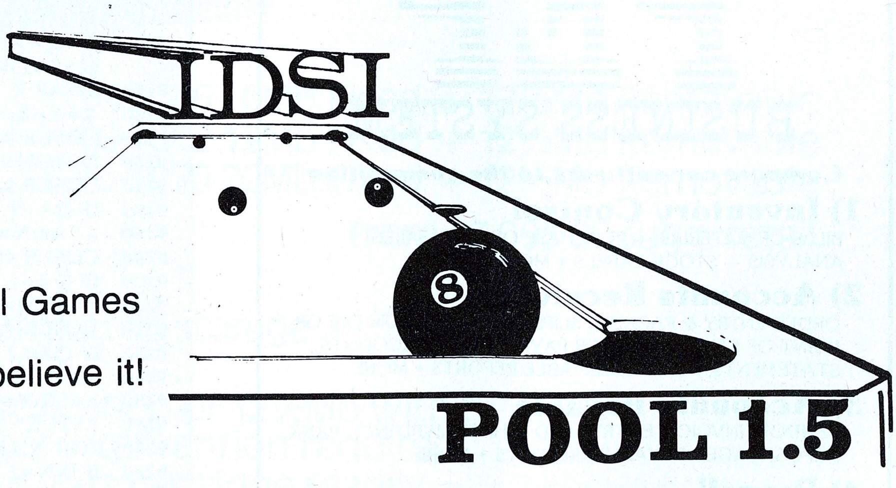
From a secluded outpost on Fox Island, a thirty-minute drive from Tacoma, Wood spent the next three years designing and constructing a prototype dish.

Before he built that, however, he built a geodesic house to live in. "It was better than a trailer," he says, "but not as good as a house."

An early model Wood made of a sun reflector, based on an experimental Russian dish made of glass mirrors glued onto chicken wire and ferroconcrete, was scrapped. The geodesic dome, a lightweight structure of interlocking polygons, provided the breakthrough approach.

Wood put the present contraption together using castoff air-

FROM



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plane parts, wheels from a 1928 International truck, melted beer cans, a twenty-year-old Navy surplus engine, and a half ton of mirrors. He also collared every human resource he could find.

"I flew all around the country getting to know the scientific community—doing research at research labs and consulting with think tanks and putting in hours at the University of Washington engineering library." He found out such things as how other concentrators worked, how they were holding up, and—most significant—the breaking point of glass.

"Conventional wisdom said mirrors couldn't bend past a certain point. Tests showed I would lose one mirror a day to breakage." Wood, ever the maverick inventor, proved the experts wrong, but not without trial by mirror. "At first I was drilling a hole in the center and trying to bend it that way. Of course the glass shattered."

The Mirror Cracked. When the dish was completed, Wood began losing some mirrors to breakage, as predicted. "It was happening mysteriously at night, when no one was around." Suspecting vandalism, Wood slept out under the big dish one night. Sure enough, he saw one of the mirrors crack.

"It was a bird! They were getting optically confused and were panicking. That's why I put the hole in the center." It was the logical thing to do. "The birds went for the sky through the hole." The dish hasn't lost a mirror since.

It could be the triangular shape of the mirrors that enabled Wood to bend them under cold stress three times farther than experts thought possible. He holds a patent on the technique. "To this day, nobody really knows how it works. It just does."

Points-in-space, or analytic geometry, is the tool that enabled Wood to compute the shape of the dish. "From points in space," says Wood, "you can define the real world's material dimensions. On a computer, you can calculate an alien's-eye view of the planet Earth and then figure down to the size of a microbe if your math is right."

Wood's first step was to design a geodesic paraboloid, a shape that can focus reflected light to a point, much the way a mirror in a flashlight does. Then he mathematically subdivided an icosahedron (a twenty-faced polyhedron) and projected the resulting pattern onto the surface of the paraboloid.

"The geodesic approach eliminates a lot of barriers in solar reflectors. The triangle is the only shape you can use to get the compound curve needed," Wood explains. He holds patent number 4,295,709 on the particular geometry of his dish.

```
 4  INPUT "move x,y ";V1,V2
 5  INPUT "scale ",V
 10  CLS
 20  KEY OFF
 30  SCREEN 2
 40  OPEN "i",1,"d04"
 50  IF EOF(1) THEN END
 60  INPUT #1,X,Y,XX,YY
 62  X=(X-V1)*V+V1
 63  XX=(XX-V1)*V+V1
 64  YY=(YY-V2)*V+V2
 65  Y=(Y-V2)*V+V2
 70  GOSUB 9000
 80  GOTO 50
 9000  A1=0 :B1=0 :A2=639 :B2=199
 9005  REM this defines corners of window for high resolution
 9010  REM X,Y - XX,YY are end points of line to be drawn
 9012  IF (X<A1 AND XX<A1) OR (X>A2 AND XX>A2) THEN
       RETURN
 9014  IF (Y<B1 AND YY<B1) OR (Y>B2 AND YY>B2) THEN
       RETURN
 9020  Q1=X:Q2=Y:Q3=XX:Q4=YY
 9030  X8=X:Y8=Y:X9=XX:Y9=YY
 9060  IF QQQ=0 THEN 9070 ELSE 9100
 9070  KEY OFF:SCREEN 2:CLS
 9080  LINE (A1,B1)-(A2,B2),,B
 9090  QQQ=1
 9100  IF X>=A1 AND X<=A2 AND Y>=B1 AND Y<=B2 AND
       XX>=A1 AND XX<=A2 AND YY>=B1 AND YY<=B2
       THEN GOTO 9240
 9110  IF XX<A1 OR XX>A2 OR YY<B1 OR YY>B2 THEN 9120
       ELSE 9130
 9120  SWAP X, XX: SWAP Y, YY:SWAP X8,X9:SWAP Y8,Y9
 9130  A=A1:B=B1:M=A1:N=B2
 9140  GOSUB 9270
 9150  B=B2:M=A2
 9160  GOSUB 9270
 9170  IF Q=-1 THEN 9240
 9180  A=A2:N=B1
 9190  GOSUB 9270
 9200  IF Q=-1 THEN 9240
 9210  B=B1:M=A1
 9220  GOSUB 9270
 9230  IF Q=0 THEN 9250
 9240  LINE (X8,Y8)-(X9,Y9)
 9250  X=Q1:Y=Q2:XX=Q3:YY=Q4:Q=0
 9260  RETURN
 9270  FOR NN=1 TO 2
 9280  IF NN=2 THEN T=T1
 9290  IF (YY-Y)*(M-A)-(XX-X)*(N-B)+QW=0
       THEN QW=E-6
 9300  T1=((X-A)*(N-B)-(Y-B)*(M-A))/((YY-Y)
       *(M-A)-(XX-X)* (N-B)+QW)
 9310  QW=0
 9320  SWAP A,X:SWAP B,Y:SWAP M,XX:SWAP N,YY
 9330  NEXT NN
 9340  IF T<0 OR T>1 OR T1<0 OR T1>1 THEN RETURN
 9350  IF Q=1 THEN 9380
 9360  X8=T*(XX-X)+X:Y8=T*(YY-Y)+Y:Q=1
 9370  RETURN
 9380  X9=T*(XX-X)+X:Y9=T*(YY-Y)+Y:Q=-1
 9390  RETURN
```

Listing of Wood's window program.

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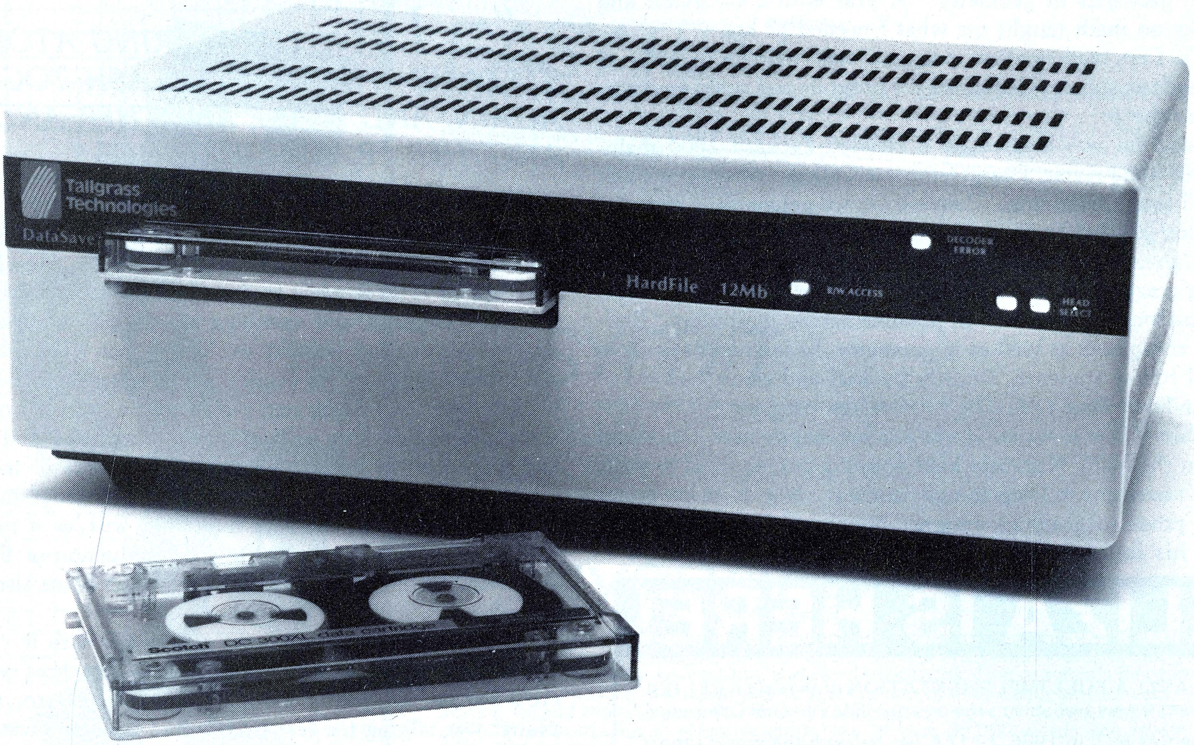
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TO COOL ME, WHEN I ENTER'D; SO INTENSE
RAGED THE CONFLAGRANT MASS. . . ."

—DANTE

"Get a Load of That Dish." Wood's tremendously expensive early efforts were financed by his work as a photojournalist and by nonprofit donations. "Solar energy has a lot of sex appeal. People love to give money for its development."

Even so, Wood might have looked like a risky investment. His college degree was in photojournalism, and he knew nothing at that time about geodesics or geometry. "A year with a calculator and some books on math taught me what I needed to know."

Wood's first mathematical program was written in 1972 to create a geodesic sphere. He hauled the program out again ten years later to test the pc.

The program was created on a Hewlett-Packard 2000 mainframe at his alma mater, Evergreen State College, where computer time is still free to students. "Points-in-space geometry is straightforward, complicated stuff involving calculations to one ten thousandth of an inch, or sixth-place accuracy," Wood says. "You'd have to be crazy not to use a computer. Designing superstructures based on parameters wasn't even possible before computers." Self-taught on computers as well as in geometry, he learned Basic from books and fellow students, "mostly by trial and error."

A Year-Long Slug Fest. The final design program for the first dish took him a year to write. "I was a rather sloppy user. I just kept slugging in the math. Numbers kept popping out, so I had to write an if-then statement to keep things running." Not quite the image of a high powered graphics designer punching dynamic abstractions into his sophisticated calculator.

"I threw elegant programming right out the window," he says. "Basic suits me fine. The nuts and bolts of computering don't interest me either. It can be a bad habit, spending more time playing with the machine than you do on the job it was designed for; I fell into it myself. But why spend three weeks making a program run one hour faster?"

When he returned to Evergreen recently to do his second-generation calculations, Wood was bugged by computer pranksters. "They're freaks that think it's neat to get into other people's programs and mess them up. That's one of the dangers of time sharing on a mainframe. They would also do things like disable the plotter." Such high jinks on the Evergreen mainframe sent him straight to his local Computerland.

". . . I SAW THE FLARING ATOM-STREAMS— FLY ON TO CLASH TOGETHER AGAIN, AND MAKE ANOTHER AND ANOTHER FRAME OF THINGS."

—TENNYSON

Wood had to be absolutely sure before setting out to redesign his dish on a microcomputer. Would it have the muscle of the H-P mainframe? A three-week tryout of his IBM showed Wood that the language, memory, and operating system behaved much like those on the 2000 he had worked on. Saving was slow, but calculations ran four times faster. He would have to learn handshaking and protocol between pc and plotter, but the pc had all sorts of trigonometric functions built into its Basic interpreter, just like the mainframe, and was ideal for dealing with those hundreds of triangles.

He dusted off his old Hewlett-Packard programs. "At first I thought the 64K would be a limitation, but, as it turned out, it's plenty." Word of the forthcoming introduction of the 8087 math chip with decimal accuracy to the sixteenth place also sold him on the pc.

Oh, and you could also run a business with it.

Wood guessed his way through those first three weeks. The micro's buffer was giving him constant system error messages, the plotter was talking too fast, and he had to write a window program for the graphics so he could address the location of any triangle. On the IBM, without such a program (see listing), lines going to points off screen default to the corners of the screen, and that default would have severely messed up Wood's detailed visuals.

A graphics monitor ("for good resolution"), a trusty Hewlett-Packard plotter ("The registration is unreal"), and an NEC printer complete Wood's minimalist computer system.

The PC That Ran Off with the Dish. Now that the pc has proved itself to Wood's satisfaction, he's busy slugging in the math on the eight design programs, redesigning the pc version of his dish. Several additional programs will serve to verify the dimensions of the mirrors, the dish's center of gravity, parts and angles, the size of the parts, and how much the mirrors can be bent.

Among the thirty-odd programs Wood has devised are three graphics programs to rotate and draw illustrations of the dish. Cut-and-paste copies of these original plotter sketches will be made into the actual blueprints when Wood commutes to Seattle to work with structural, mechanical, thermal, and electrical engineers.

The bells in the clock tower chime their tune every hour, half hour, and quarter hour. The deep, resonant ringing doesn't disturb Wood, grappling with his points in space by night or marketing his parabolic dish by day. He says he's used to jumping fences. The addition of the pc to his solar world is one more technical challenge to the eager, self-taught inventor.

"It's more exciting to have a need and then discover the personal computer than it is to buy one and have to find a need," he says. "Geometry and computers fit together well." ▲

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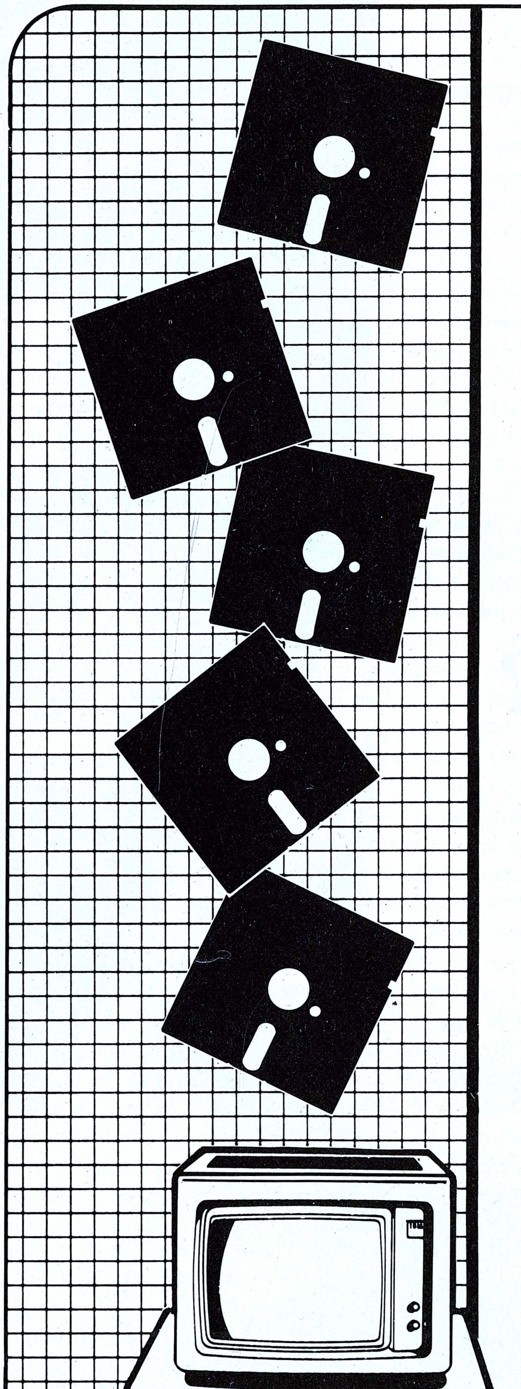

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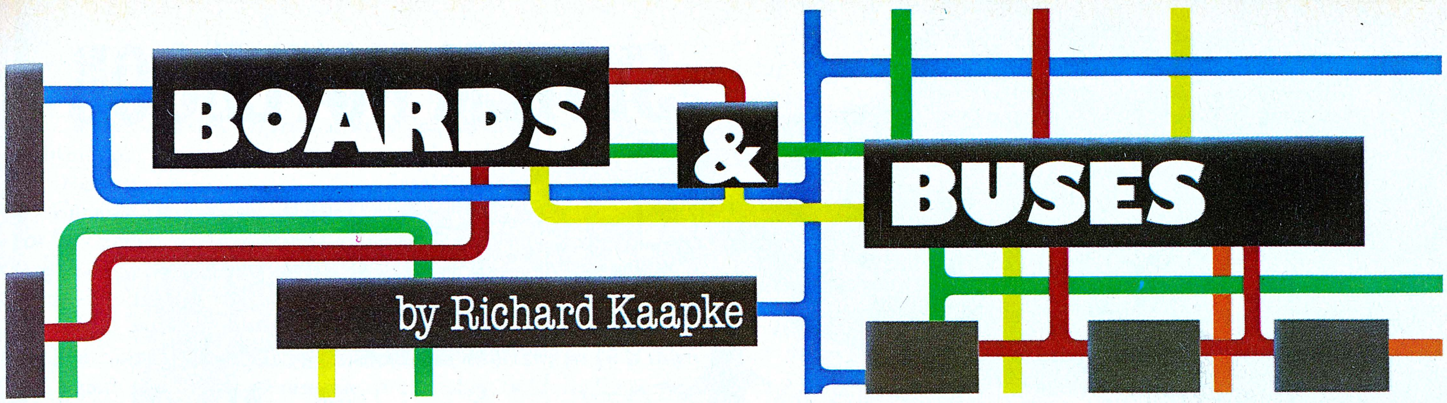

BOARDS & BUSES

by Richard Kaapke

The number of multiple function and extended memory boards available for the IBM Personal Computer is increasing at an accelerated rate. Seemingly, the problem facing you as a buyer these days is not whether you can get all the functions you want on a single card, but whether you can put these functions effectively to work with software. This month we'll look at a couple more cards (both of which come with software) and at some possibilities for putting these cards to use.

The JRAM board by Tall Tree Systems provides 512K of RAM on a single card. Special circuit design allows more than one of these boards to be put into the pc, with the additional JRAM cards on a *bank select* circuit that governs which 512K of memory will be in use at any moment. By this system, only one 512K board is active at any one time; all others are in a standby mode, awaiting a signal to become active.

JFormat is included with the JRAM board. This software will let you use one or more of your JRAM memory cards as an "electronic disk drive," giving you the ability to put files into the memory card and access them as though they were on a disk drive.

Electronic disk drives do not hold their data after the computer is turned off, but they're very handy in the event you need to increase the speed of a file search or sort, since such operations typically take a hundred times longer to perform on floppy disk data than on data held in RAM. Once the operation is completed, the sorted file or information can easily be recorded on floppy disk until next time.

JFormat also includes a print spooler—a program that uses part of that memory that's been set aside for the electronic disk drive as a buffer in which to store print data. The spooler takes the information you wish to print and feeds it to the printer, allowing you to do something else with your computer while the printer is printing.

By formatting disks with ten sectors per track instead of eight, *JFormat* will also give you 25 percent more storage on a disk than you get with the normal DOS Format program. With two-sided disks and *JFormat*, you can get 400K per disk.

JFormat will also accommodate the Tandon TM100-4 "quad" drive, formatting eighty tracks, double-sided and double-density, to provide a total of 800K per disk. *JFormat* will allow a TM100-4 to read a single-sided or dual-sided forty-track disk without problems. It will also write to a forty-track disk on a TM100-4.

An automatic sensing feature allows a disk made with *JFormat* to accept and work with any hodge-podge combination of disks inserted in the system drives (of course, you mustn't put an eighty-track disk in a forty-track drive or try to read a dual-sided disk in a single-sided drive).

With appropriate interface cards, you can attach eight-inch floppy drives to your pc and *JFormat* will read and write to them—in IBM 3740 format as well as two or three other formats. With the *JFormat* program (which is available separately for those interested), up to six drives can be addressed by DOS (as opposed to the standard maximum of four) and any combination of eight-inch, single-sided, dual-sided, and quad drives can be accepted.

The *JFormat* package also provides a high-speed file transfer program, meant to replace the DOS Diskcopy program. The high-speed file copier is intended to move data between two differently sized disks, such as from a dual-sided to a single-sided disk. You can also use it to transfer files from large disks (quad or eight-inch, ten-sectored or eight) to standard floppy disks (single or double-sided). And, of course, you can also use the program to copy files between disks of the same format.

JFormat can work well with hard disk drives offered by Corvus, DTC, Datamac, Davong Systems, Santa Clara Systems, Mountain Hardware, and Xebec. Any sized portion of the hard disk drive can be accessed as one of the six volumes referenced by *JFormat*, and files can be transferred from one portion of the disk to another. Also, *JFormat* can be used to format hard disks in the event that the manufacturer's formatter and access method are unacceptable.

Quadram. The Quadram Corporation Quadboard is a useful multiple-function board that contains memory (field-expandable from 64K to 256K), a single asynchronous communications adapter (serial port), a parallel printer adapter, and a battery-powered clock/calendar.

Using the Quadboard, you may have the computer automatically answer the date and time questions by reading the values from the clock/calendar. A simple program, included on disk with the Quadboard, will accomplish this for you. Another included program will set the clock/calendar on board to the values you specify. The battery that keeps the clock/calendar "ticking" has a five-year life expectancy.

The asynchronous communications adapter included on the Quadboard is mounted on the back of the card and has a connector exactly like that of the IBM asynchronous adapter. All programs that require the IBM asynchronous adapter should work fine with the Quadboard.

The parallel printer adapter included with the Quadboard is intended to mount in a "breakout" in the rear panel of the pc. In the event one has a computer without a hole for this connector, it is simple (but not pretty) to hang this connector and cable out the back. Any printer that works with the IBM Parallel Printer Adapter will work as well on the Quadboard.

An electronic disk program is supplied with the Quadboard, but unlike the electronic disk managed by Tall Tree's *JFormat* program, the Quadram electronic disk cannot exceed 320K in capacity. Smaller-sized volumes (from 32K on up in increments of 32K) can be designated as electronic disk.

At $595 with 64K installed, the Quadboard is a good value in a multiple-function memory board. The JRAM board with 512K is a bargain at $800, provided that you need that much memory. If you prefer to buy the *JFormat* program separately, you can get it for $60. In order to allow for electronic disk and print spooling, 128K is a suggested minimum amount of memory. ▲

Quadram, 4357 Park Drive, Norcross, GA 30093; (404) 923-6666. **Tall Tree Systems,** 1036 Los Altos Avenue, Los Altos, CA 94022; (415) 941-5500.

SYSTEM NOTEBOOK

by Alan Boyd

Over the past seven months, we've been digging into the various commands that allow you to interact with the disk operating system. In fact, we've covered all the DOS commands except one—*chkdsk*. This command may seem trivial at first; its primary purpose is simply to determine the amount of space remaining on a given disk. There are, however, several other uses for this lowly command.

Unfortunately, before we can get to the secondary uses of *chkdsk*, we need to acquire a perfunctory knowlege of the internal structure of the DOS directory system. So this month we'll open the lid and take a good look at the inner workings of the file management system.

You may recall that several months ago, when we were discussing the disk formatting procedure, we encountered the concepts of a disk *directory* and a *file allocation table.* At that time, though, we sped on by without paying much attention to those terms. This month we'll see how the directory and FAT actually function and how DOS goes about keeping track of which files are stored on a disk, what types of files there are, where the various components of each file are kept, and how free space on a disk is allocated.

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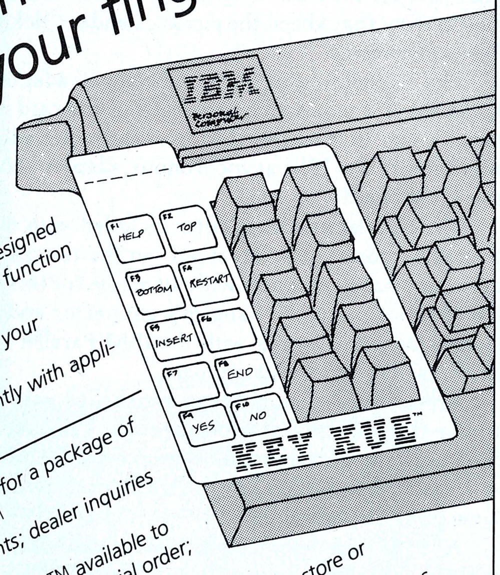

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To many people this type of information is a requirement of everyday life; these people should find this article interesting reading. To others, however, this installment may end up sounding like a modern-day rendition of the famous Abbott and Costello "Who's on First" routine. It should be kept in mind that this type of information is about as necessary for the daily operation of the IBM Personal Computer as an understanding of fuel injection is necessary for the operation of a car.

So, Who Is on First? When DOS formats a blank disk, it writes certain markings onto the disk to distinguish the various tracks and sectors, so that it can subsequently read and write data to and from the disk in an orderly fashion. It also creates two very important tables: the directory and the file allocation table. These two tables embody DOS's mechanism for keeping track of where each file is stored and how much disk space is available for new files. Both these tables are located on track 0, whether the disk in question is single-sided or double-sided.

The directory is literally a table of contents of a DOS disk. Earlier in this series you saw how the *dir* command could be used to display information about the various files on a disk. The information that command retrieved for display came from the directory. The information displayed by *dir,* however, is not all the data that DOS stores about each file; *dir* only displays the stuff that would have meaning to us human types.

As you can see by typing *dir* at the command line interpreter, the typical directory entry looks something like this:

COMMAND COM 4959 5-07-82 12:00p

Obviously this data represents the filename and filename extension, the length of the file in bytes, the date on which it was created, and the time at which it was created. In addition to this information, DOS also stores information about what type of file it is—normal, hidden, or system; this information determines whether the file will be included in *dir* displays. DOS also records a pointer that determines how the directory entry relates to that other table, the file allocation table.

On a standard single-sided disk, DOS allocates four sectors for the directory. Since each sector is 512 bytes long, this allows a total of 2,048 bytes for the directory. These bytes are divided into sixty-four individual entries, each thirty-two bytes long. This allocation of space within the directory is what sets the maximum number of files that can be stored on a single-sided disk at sixty-four.

On a double-sided disk an additional three sectors are allocated to the directory. A quick calculation will show that this additional space enables the inclusion of forty-eight more directory entries, allowing a total of 112 files on a double-sided disk.

Take another look at the *dir* display for Command.com. You'll see there are a total of twenty-seven characters displayed for that particular entry. Since that number is so close to the thirty-two bytes allocated for each directory entry, you might be tempted to believe this is actually the format in which DOS stores the directory information. Unfortunately (actually it's not unfortunate), this is far from so.

Generally computers store information in a way that's not meant for humans to understand intuitively. Instead they store it in a format that makes it relatively easy and quick for computers to get at. An examination of the internal format of a DOS directory entry will verify this point.

File Names. The total length of a DOS directory entry is thirty-two bytes. The first eight of these, predictably, hold the filename. If the filename has fewer than eight characters, DOS fills the unused character positions with the byte that represents the space character. It has to put something into those unused positions so that the length of the filename field will be the same for all directory entries. (This facilitates the retrieval of filenames on directory searches.)

When DOS searches the directory for a particular filename, it reads each individual entry only up to the first space character. It then ignores all characters that follow that first space. In general this rule holds true for all DOS parsing, including the parsing of information entered into the command interpreter. You can see that this is so by trying to create a file with a space character in the filename. For example, try the following:

```
COPY CON: MY FILE.BAT
```

with a space between *my* and *file.bat.* Now type

```
This is a test
^ Z
```

After you create this file, if you try to list it by typing *dir,* you'll see that the file appears to have been saved as simply My. All the characters after the space, including the extension, have been ignored by DOS. Since this file now doesn't have the extension .bat, it can't be executed as a batch file, even if you enter a command that duplicates the information you entered in the *copy* command. Try it and see, by entering

```
MY FILE.BAT
```

DOS will return a *file not found* error message.

DOS determines if a directory entry is in use by first checking to see what the first character in the filename is. If the first character is a hexadecimal E5, then DOS knows that that particular entry in the directory either represents a file that has been deleted (in which case that slot in the directory is now available for reuse) or has never been used.

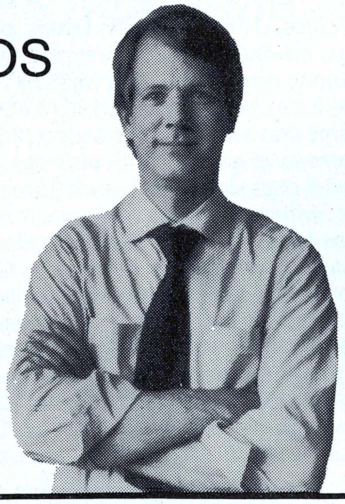
For the uninitiated, hexadecimal is a method of representing the numbers from 0 to 255 in two digits, each of which uses a base-sixteen arithmetic. In the older days of programming, when software tools were few and far between, it was important—in fact, mandatory—that programmers learn to perform simple arithmetic in hexadecimal (or the earlier developed octal) notation. The tradition lives on to this day. Although it isn't necessary for a computer user to understand this cryptic form of counting, hexadecimal does present a somewhat elegant method of relating internal computer codes. That E5 we just saw could easily be translated into decimal as 229, but talking about a mystical hexadecimal E5 will make more of an impression on the neighbors and children than talking about an everyday 229.

Back on the track, the next three bytes of the directory entry hold the filename extension. As with the filename, all three character positions are filled out with spaces if they haven't been used. Just for an exercise, you can repeat the last example, this time using a filename extension that contains a space. Again, it can be demonstrated that DOS only stores the name in the directory up to the first occurrence of a space character.

If, for example, you attempt to create a file by the name of

```
MYFILE.B T
```

DOS will simply store it as Myfile.b.



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The Attribute Byte. The twelfth byte in each directory entry is called the *attribute* byte and is used to store and recall several properties of a file. As you may remember, each byte consists of eight individual bits, each of which may exist in either of two states—zero or one. Many software designers use the individual bits of certain bytes as switches or "flags" by which to indicate properties or conditions of something—a file, perhaps, or some aspect of a running program.

DOS's attribute byte can be thought of as a bank of eight separate flags, each of which can either be off or on, zero or one. Currently there are only a few configurations of the attribute byte that are meaningful to the system, although many of the other possible states are probably earmarked for future expansion or enhancement of the operating system.

Currently, if a file's attribute byte is set to zero—that is, if all the bits are turned off—that file is recognized by the system as a *normal* file. Normal files are the typical files that you see listed when you issue a *dir* command; they may be Basic programs, batch files, word processor data files, *VisiCalc* models, external DOS commands, or whatever. Normal files are subject to the normal operation of DOS; that is, they are subject to the operation of *copy, erase, comp,* and other DOS commands.

The first or so-called *least significant* bit of the attribute byte currently has no assignment. If it is turned on (which it should not be!), it has no effect on the file.

The second bit is the *hidden* file bit. If a file has an attribute byte with this bit on (in which case the attribute byte would contain a value of 2), then it will not appear in a directory listing invoked by the *dir* command. In other words, the file will exist on the disk and will have an entry in the directory, but certain DOS operations will not be able to act upon it. These DOS operations include the commands *dir, copy,* and *erase.*

Undoubtedly, utility programs will be available that will allow you to convert normal DOS files to hidden files and vice versa. Converting a normal file to a hidden file will offer you a fair degree of security if you need to have sensitive information stored on a disk that's in use in a public situation. There's no reason not to make this conversion if you want to; it doesn't harm anything and it does add a valuable feature for some applications of DOS disks.

The third bit in the attribute byte is called the *system file* bit. If this bit is turned on (giving the attribute byte a value of 4), the file is designated a system file. We've already encountered two system files in an earlier article. You may recall that the DOS system itself is stored in several files, two of which, the files Ibmbio.com and Ibmdos.com, are stored on every DOS master disk. These two files are part of the operating system itself and have been stored as two separate files for the purpose of modularity. However, these files do not appear in directory listings invoked by *dir.*

System files, like hidden files, are immune to the actions of such high-level DOS commands as *dir, copy,* and *erase.* It's reasonable, thus, to ask what the difference is between a hidden file and a system file. Well, the answer at this time is there isn't any essential difference—just nomenclature. Future versions of DOS, however, may treat system files and hidden files differently.

In fact, the two DOS systems files just mentioned Ibmbio.com and Ibmdos.com—have their attribute bytes set to 6. That means they have both the hidden file bit and the system file bit set to on. They are therefore described as *hidden system* files.

All the other bits in the attribute byte have, as yet, no significance. Turning them on does nothing constructive or destructive. However: *Do not play around with these bits.* If you have the capability of accessing these bits through any of the commercially available utilities, stay away from the attribute byte. Many of the other five bits are earmarked for future DOS enhancements. Tampering with them now may cause disastrous results when you upgrade to a later version of the operating system.

So far we've accounted for the eight bytes assigned for the filename, the three for the extension, and the attribute byte. The next ten bytes are not used by DOS at this time; they are, however, reserved for future use. The original version of DOS, 1.0, had twelve bytes in this reserved group. DOS 1.1, however, introduced time stamping, and this feature required two bytes from the pool of free reserved bytes. This is a perfect example of how DOS can expand and make use of reserved spaces. Keep in mind that when the DOS manual says an area is "reserved," that's exactly what it means. Future usage of this area is planned.

Time Stamping. The two *time* bytes are therefore the next two bytes in the directory entry. Every time DOS is asked to create a new file or update an old one, it retrieves the current system time from the internal clock—the clock you set whenever you boot the system—and stores it in the time bytes in the directory. That way, each file is "time stamped" whenever it's altered.

The time stamping feature, if used correctly, can be incredibly handy for people who are writing programs; it's also useful in situations where data files are updated and backed up frequently. Time stamping allows the operator to keep track of where the most recent version of a particular file is, thus facilitating the incremental backup of a large hard disk. It's important for anyone who handles vital information on disk to keep the internal system date and time as close to reality as possible.

You may recall, however, that when you boot the system or issue the *time* command to the command line interpreter, DOS responds with a prompt that looks something like this:

```
Current time is 13:06:19.79
Enter new time:
```

And you may be wondering just how DOS manages to cram all those numbers into just two bytes. Well, with one eight-bit byte to work

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with, DOS can store a number up to 255 (two to the eighth power minus one). With two bytes to work with, DOS can store any number from 0 to 65,535. Since there are twenty-four hours in a day, sixty minutes in an hour, and sixty seconds per minute, there are a total of 86,400 seconds in a day. Obviously, then, DOS cannot store the exact time, to the nearest second, in the two time bytes.

When DOS creates or modifies a file, it actually rounds the time to the nearest two-second interval and converts that time to an absolute number between 0 and 65,535. The result is stored in the time bytes. The method by which DOS converts the time to a number is somewhat elaborate, but quite interesting. Imagine the two eight-bit time bytes as a single continuous block of sixteen bits. DOS converts the hours portion of the time to a five-bit binary number and stores that number in the upper or *most significant* bits of the sixteen. It then converts the minutes to a six-bit binary number and stores that value in the next six most significant bits. This means that the minutes field is actually distributed between two separate memory locations, since it overlaps the boundary between the two time bytes. Three bits are stored in the upper byte and three in the lower.

The remaining five bits of the time bytes hold a number between 0 and 29, which represents the number of two-second increments.

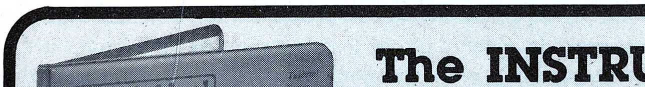
Under this scheme there are no redundant bits and no long conversion formulas that DOS has to run through to convert some cryptic time storage mechanism into a form recognizable by humans. The hours component, which can take on values only between 0 and 23, fits well into five bits (five bits can represent any quantity between zero and thirty-one). The minutes component, which holds values between 0 and 59, fits comfortably into six bits, and the number of two-second increments, like the hours component, fits into five bits.

This coding system is explained in a perfunctory manner in Appendix C-3 of the IBM DOS manual, although one item isn't made clear there. That item is the order in which the two time bytes are stored in memory. From the manual's explanation, it would appear that the most significant byte of the pair is stored in the higher memory location (the farther offset from the beginning of the directory entry). In fact, however, it's the other way around.

If the time bytes happen to be set to zero, then the time field is not displayed on screen when you issue a *dir* command. The time recorded in the directory in that case would be 00. If you increased the value of the time bytes to 01, you might believe that you'd be adding two seconds to the time recorded in the directory entry and that the directory entry would therefore read 12:00:02. In fact, however, what you'd have done is increase the least significant bit of the most significant byte; if you work that out, you'll discover that changing the time bytes from 00 to 01 actually adds eight minutes to the file's creation time. This is not particularly important until you get as far as writing your own programs and you need to access this information from the disk.

Date. The two bytes in the directory entry that follow the time bytes contain a similarly packed code that stores the date at which the file was last saved on disk. In the coding scheme for these two bytes, the year is stored in the most significant seven bits. Seven bits can represent numbers between 0 and decimal 128. DOS, however, only uses values up to 119. A constant of 1,980 is added to whatever value is held in these seven bits (there was no DOS before the year 1980); the resulting sum then may represent any of the years from 1980 to 2099. Needless to say, DOS was designed to outlive its usefulness.

The month (a number between one and twelve) is stored in the



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following four bits, and the day is held in the last five bits. Again, the two bytes are juxtaposed in memory.

You are probably asking yourself why DOS goes to all this bother, just to store the date and time in two bytes each. Well, consider this. If each of these fields were expanded to three bytes, with one byte each for hours, minutes, seconds, year, month, and day, the date and time would consume an additional two bytes for every directory entry, making the directory entries thirty-four bytes apiece in length. That would mean that only fifteen directory entries could fit in a disk sector. On a single-sided disk, we would lose the capacity to store four files. On a double-sided disk, we'd lose the storage of as many as seven files.

There's another reason for cramming the time and date fields into sixteen bits each—a reason that's more important than the conservation of file directory space. As two-byte fields, the time and date are very easily manipulated by the Intel 8088 microprocessor—the heart of the pc. Because the 8088 is a sixteen-bit microprocessor, it is able to do certain operations, such as the comparing of two sixteen-bit quantities, at remarkably high speed. The designers of the operating system wanted to be able to take advantage of this speed by holding the time and date quantities to sixteen bits each.

Right after the two date bytes in the directory entry are two more bytes that are used as a pointer. They hold what's called the *starting cluster* number and are used to link a file's directory entry with the disk's file allocation table.

The directory information is DOS's method of keeping track of *what* files are on a disk. The file allocation table continually reminds the directory *where* the file contents are physically stored. The starting cluster provides the link between the directory and the file allocation table. This number, like the time and date information, is stored with the least significant byte closest to the beginning of the directory entry. Since this pointer is so integral to the format of the file allocation table, we will defer a detailed discussion about it until we have a clearer picture of the file allocation table.

File Length. The final four bytes in the directory entry are the place where DOS keeps track of the length of the file—in bytes or characters. The number is stored as two separate sixteen-bit values, with the least significant number first. Within each number, the least significant byte is stored first. This arrangement can make for a rather confusing combination for people who aren't used to the hows and whys of programming techniques. You can avoid the confusion by always letting DOS create your files for you—which, of course, is how most of us will use the operating system.

If for any reason the length number gets changed in such a way that it no longer represents accurately the size of the file, DOS will have a hard time loading your file and will return the error message

File Allocation Table bad

And if the file whose length entry gets messed up is Command.com, DOS will return an error message that says

Invalid COMMAND.COM

and prompt you to insert the correct disk. If either of the hidden system files is damaged, then DOS will probably not boot at all. If that should happen to you, simply copy all the valuable files from your damaged disk to a new disk.

Obviously DOS must be capable of handling very large files if it allocates four bytes for the file size. Indeed, four bytes (thirty-two bits) can represent any quantity up to two to the power of thirty-two—a ridiculously high number when compared to the disk capacity of even the largest available hard disk.

This number represents the total number of characters that can exist in a single DOS file. It should be obvious that DOS has been designed to overcome certain frustrating limitations of older, less sophisticated operating systems that couldn't handle particularly large files. In olden days (at least six months ago), computer users were confronted with operating systems that could not address a large peripheral storage device, such as a Winchester disk, in an acceptable fashion.

DOS has borrowed this upper theoretical limit for file length from Xenix, its big brother in the Microsoft family of operating systems. Xenix is a superset of Bell Labs's minicomputer operating system, Unix. Much of the expansion of DOS in the future will be in the direction of Xenix.

We have seen how DOS simply extended the number of sectors that were allocated to the file directory as it progressed from single-sided (release 1.0) to double-sided (release 1.1) disks. It's easy to see that the directory can be extended by even more sectors in the future to allow the handling of larger mass storage devices. For extremely large storage devices, however, such as an 80-megabyte hard disk, DOS's one-dimensional list of directory entries may become very unwieldy—for about the same reason that an ancient papyrus scroll is unwieldy when compared to a modern book.

Xenix, because of the way it handles directories, is highly adept at dealing with such large devices. The method involves directories that are contained within other directories, producing a hierarchical file structure. The insides of DOS are set up in such a way that this kind of hierarchical structure is a distinct possibility for the future; we'll cover this topic in a subsequent article.

All that's been said in this installment leads us directly to the mysterious file allocation table, which has been alluded to several times during this series. But first—we had started this episode with an introduction to the DOS external command *chkdsk*. Unfortunately there isn't enough storage space in this month's column to hold all the information required for a solid understanding of *chkdsk* and related subjects. So these topics will have to wait until next month. ▲

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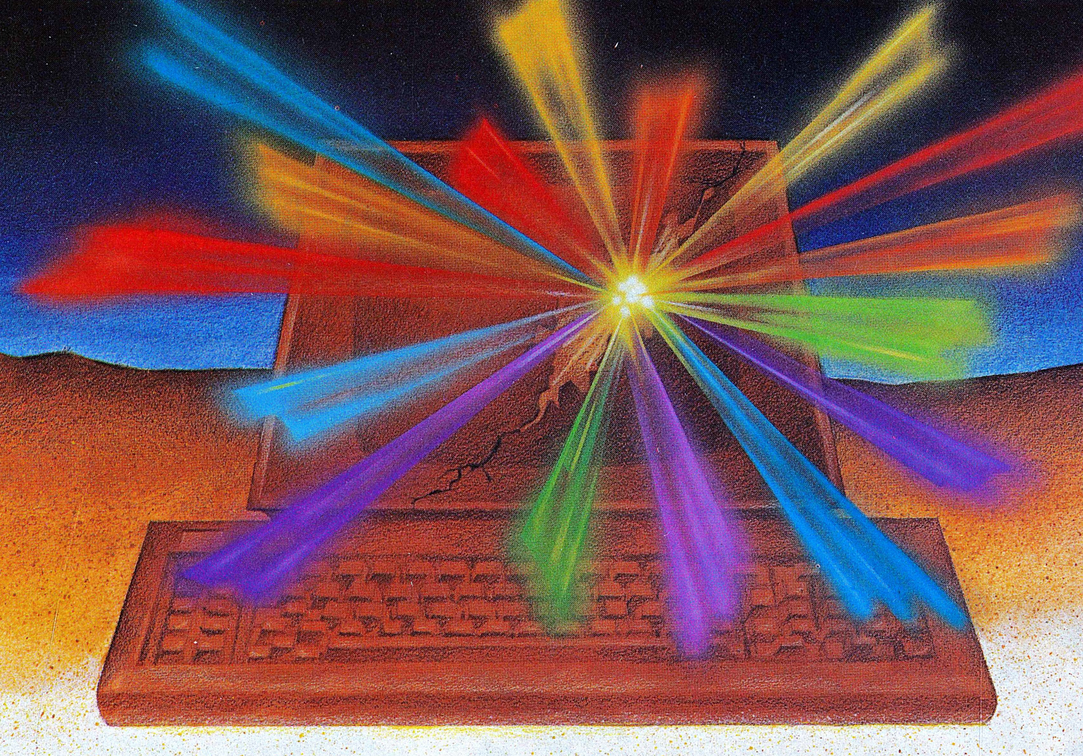

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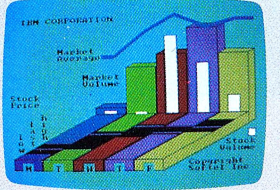
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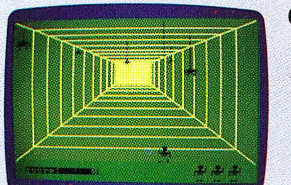

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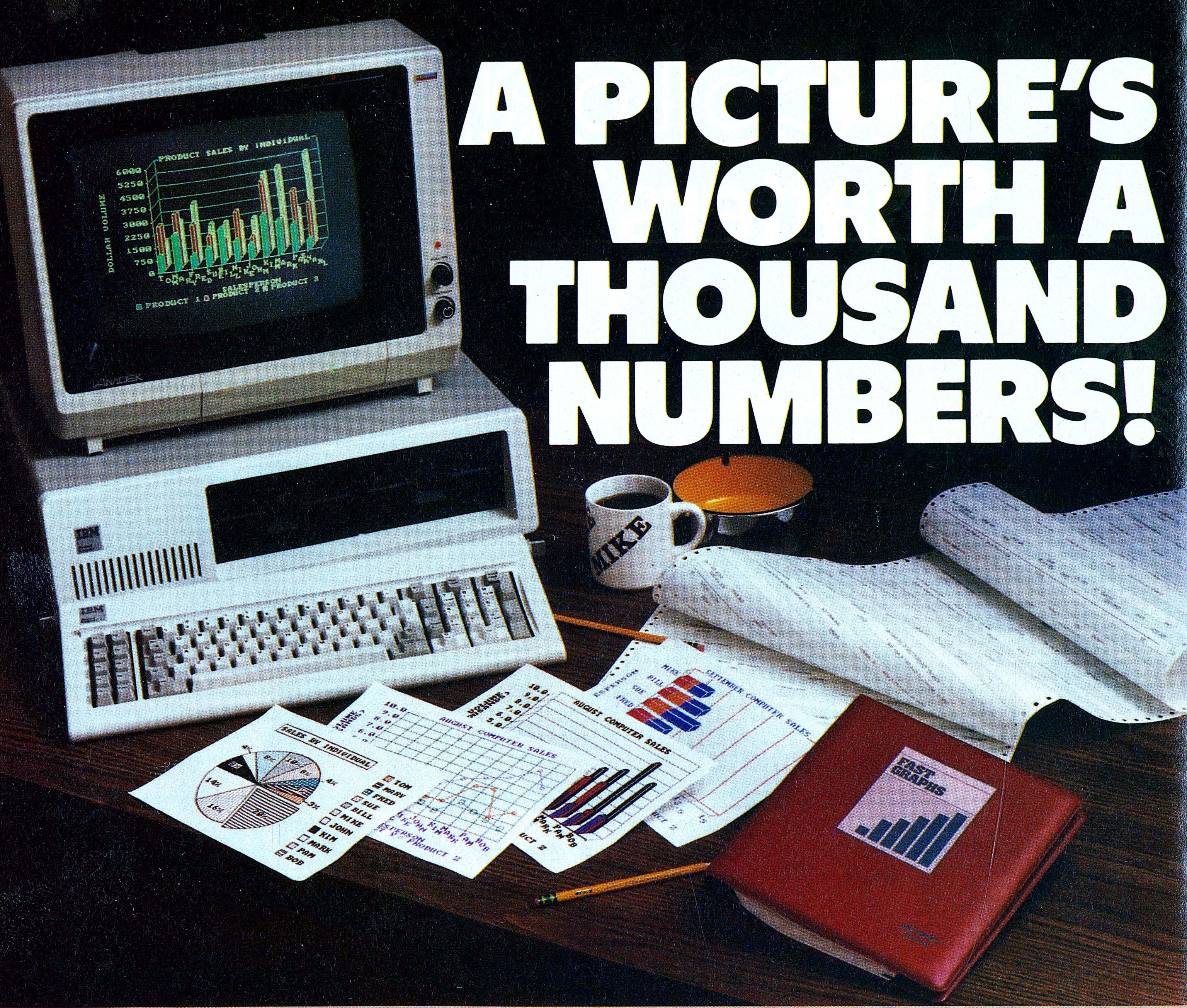
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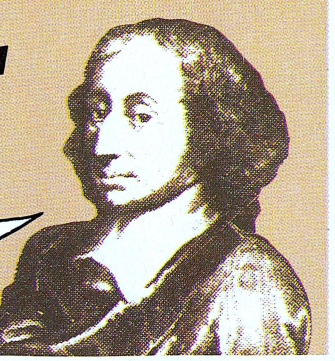

by Bruce F. Webster and Deirdre A. Wendt

Our last two columns covered the basics of writing a Pascal program and explored variables in some depth. This makes for a good foundation but is hardly sufficient to impress that uppity programmer we've been referring to.

Yes, you can produce Pascal code based on what you know from these first two columns; but it would be rather dull. Let's see if we can't liven things up a little.

One of the great buzz words (buzz phrases?) of computer science is "flow of control." This term refers to the order in which the statements in your program are executed. Up until now, we've only looked at *sequential* flow of control. Simply put, sequential flow of control means that each statement is executed exactly once, starting with the first statement and ending with the last. Nice, but it won't get you far.

To provide a little variety, Pascal has a number of *control structures*—special constructs that allow you to have nonsequential execution of statements. There are three types of control structures in Pascal: conditional, iterative, and case.

The goal of the next two columns is to explain what these constructs are and how you use them. Before we dive into control structures, however, we first need to look at a few basics: statements and boolean expressions.

Statements. The primary unit of execution in a Pascal program is the *statement*. At the simplest level, there are two kinds of statements: assignments and procedure calls. Procedure calls we'll ignore for now, which leaves us with assignments. These take the form

```
<variable> := <expression>;
```

where <expression> is—well, an expression that resolves to a value appropriate to the data type of <variable>. For example, if the variables *score* and *maximum* are of type *integer*, then the following statements are valid:

```
score := 0;              (* initialize score *)
maximum := 0;            (* initialize maximum *)
score := score + 10;     (* increase score by 10 *)
maximum := score;        (* set maximum equal to score *)
```

All but one of the control structures we'll be looking at will execute only one statement. This doesn't sound very impressive or convenient and, in fact, it would make for a very serious limitation if the only statements allowable were the simple kind just described. Such fortunately is not the case. Pascal considers the following structure to be a single statement·

```
BEGIN
   <statement1>;
   <statement2>;
      .
      .
   <statementN>;
END;
```

This structure is known as a *block statement*. It can be used anywhere that a simple statement can be used; you can even use one block statement within another. Block statements are most often used in conjunction with control structures, as we'll soon see.

Boolean Expressions. A moment ago we were looking at expressions—integer expressions in particular. The expressions we listed were integer expressions because they returned integer values. A boolean expression is an expression that returns a boolean value—in other words, one that evaluates to either true or false.

For example, suppose our integer variables, *score* and *maximum*, have each been set to some value. We can now create the following boolean expressions:

```
score >  maximum    (is greater than)
score =  maximum    (is equal to)
score <  maximum    (is less than)
score >= maximum    (is greater than or equal to)
score <= maximum    (is less than or equal to)
score <> maximum    (is not equal to)
```

Depending on the values of *score* and *maximum*, each of these expressions will either be true or false. For example, if *score* has been set to 2500 and *maximum* to 2350, then the first, fourth, and sixth statements will be true, while the others will be false.

In a Pascal program, such statements would actually return true or false, the two possible values of the predefined data type *boolean*. We could define a boolean variable, *newmax*, and then have the following assignment statement:

```
newmax := (score > maximum);
```

Depending upon the current values of *score* and *maximum*, this would set *newmax* to either true or false. For example, *newmax* would receive a value of true given the values mentioned in the previous paragraph.

We can create more complex expressions using the boolean operators *or*, *and*, and *not*. *Not* inverts a boolean expression, changing true to false and vice versa. *And* and *or* combine two expressions to create a new one. Figure 1 is a truth table that illustrates how these operators work.

Using these operators, we can create such expressions as

```
(score > maximum) OR (score > 30000)
(score > 10000) AND (score <= 20000)
NOT (newmax OR (maximum = 0))
```

exp1	exp2	exp1 OR exp2	exp1 AND exp2	NOT exp1	NOT exp2
false	false	false	false	true	true
true	false	true	false	false	true
false	true	true	false	true	false
true	true	true	true	false	false

Figure 1.

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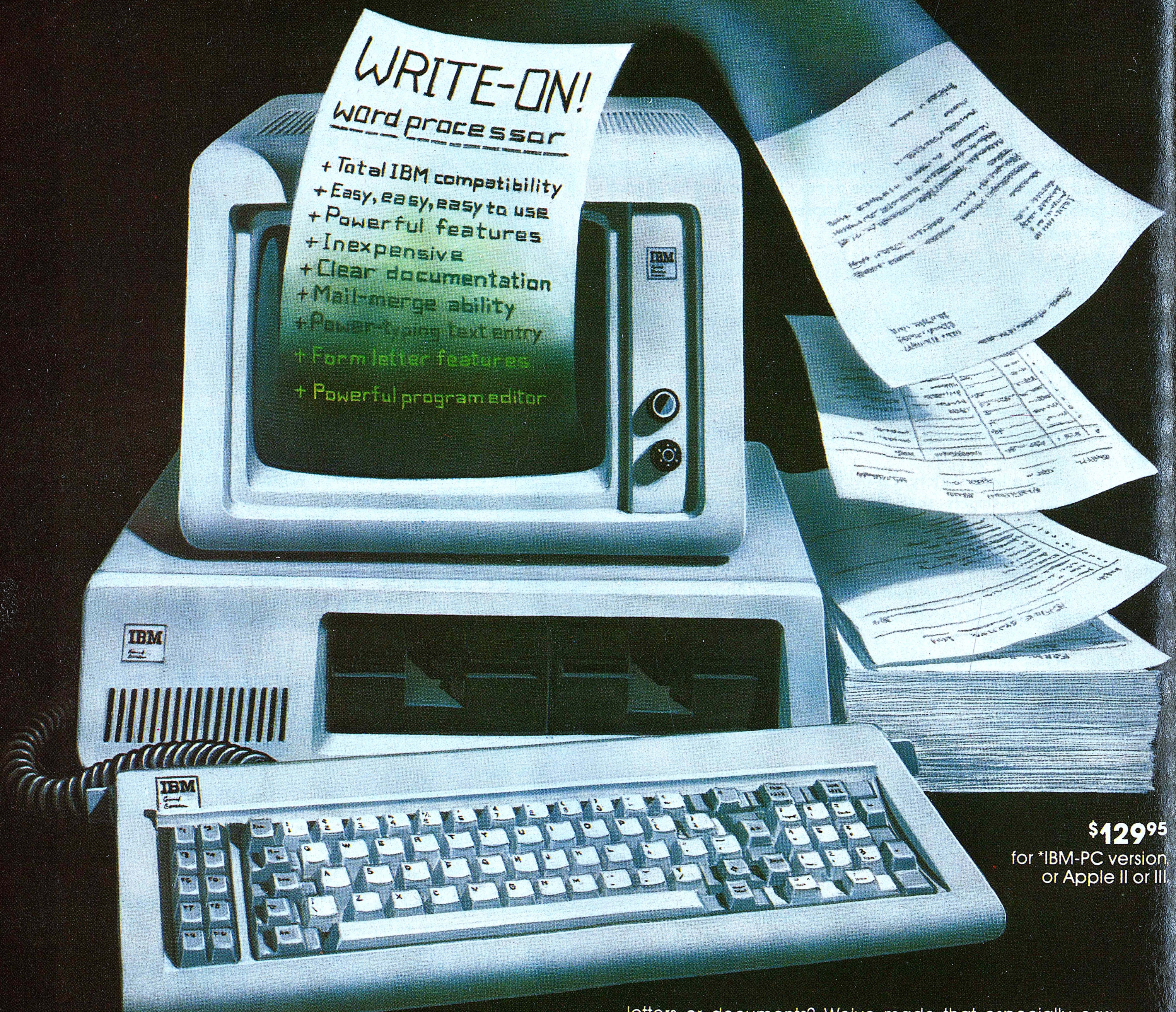
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If we assume that *score, maximum,* and *newmax* have the values mentioned earlier, then the first expression evaluates to true, while the other two evaluate to false. Now on to control structures.

Conditional Execution. In writing programs, we usually have groups of statements that we want to be executed only if some condition has been met. Amazingly enough, this kind of statement results in what's called *conditional execution.* In Pascal conditional statements take the form

```
IF < boolean expression >
      THEN < statement>;
```

(Note that all examples of Pascal code in these articles reflect the formatting preferences of the authors. The statements

```
IF< boolean expression > THEN < statement >;
                           IF
                 < boolean expression >
                          THEN
                     < statement >;

IF
< boolean expression >
THEN
< statement >;
```

are all syntactically equivalent.)

The *if..then* structure works quite simply. If< boolean expression >returns a value of true, then< statement > is executed. Otherwise, < statement >is ignored. For example,

```
IF score > maximum
     THEN maximum := score;
```

will set *maximum* equal to *score* if and only if *score* is greater than *maximum.* We could also do the following:

```
newmax := (score > maximum);
IF newmax
     THEN maximum := score;
```

If we really want to get fancy, we can do this:

```
IF score > maximum THEN BEGIN
   maximum := score;
   writeln('Congratulations!');
   writeln('Your new high score is ',maximum)
END;
```

Tied closely to the idea of conditional execution is that of *alternation.* Alternation means that one set of statements is executed if a condition is true and another set of statements is executed if that condition is false. We could do it this way:

```
IF < condition >
   THEN < statement1>;
IF NOT < condition >
   THEN < statement2>;
```

Pascal, however, provides a simpler way:

```
IF < condition >
   THEN < statement1 >
   ELSE < statement2>;
```

Using the *if..then..else* construct, we can amplify our example as follows:

```
IF score > maximum THEN BEGIN
   maximum := score;
   writeln('Congratulations!');
   writeln('You have set a new high score of ',maximum)
END

ELSE BEGIN
   writeln('Your score was ',score);
   writeln('Nice try, but you can do better');
END;
```

And that's about all you need to know about conditional execution. Or, at least, it's all we're going to tell you.

Iteration. Conditional execution adds a lot to our programming capabilities, but we still have a major handicap: we can execute each statement only once. We need the ability to repeat a section of code some number of times or until some condition is met. This continual looping process is known as *iteration.* Niklaus Wirth must really have liked loops, because Pascal has not one, nor two, but three forms of iteration: *for..do, while..do,* and *repeat..until.* Let's look at each.

There are situations where we want to have a statement executed some number of times. Often, we want or need to know how many times we've gone through the loop so far. Or we might want a variable to step through a range of values and to execute some statement once for each value.

The *for..do* loop allows us to do this. It uses the format:

```
FOR < variable > := < expression1 > TO < expression2 >
   DO < statement >;
```

When the loop is encountered, < variable > is assigned the value of < expression1 >. Assuming that < expression1 > is less than < expression2 >, < statement > is executed; then < variable > is incremented and the test is repeated. This goes on until < variable > is greater than < expression2 >. If < expression1 > is greater than < expression2 >, then < statement > is never executed.

For example, we could write:

```
FOR indx := 1 TO 10
   DO writeln('indx = ',indx,' index squared = ',indx*indx);
```

This will write out the integers from 1 to 10 along with their squares. If we want to decrement < variable > instead of incrementing it, we can use the format:

```
FOR < variable > := < expression1 > DOWNTO < expression2 >
   DO < statement>;
```

Now < variable > decreases each time until it is less than < expression2 >, and < statement > is never executed if < expression1 > is less than < expression2 >.

The *for..do* loop in Pascal sacrifices convenience for a gain in power. You cannot specify a *step* value by which to change < variable >, as you can in most other languages. To do that, you have to create your own *for..do* loop using one of the other conditional loops about to be described. Also, < variable > cannot be of type *real;* again, you have to use one of the other kinds of loops.

So much for the inconvenience; now, where's the power? Well, < variable > does not have to be of type *integer;* it can be of any scalar data type: *char, boolean,* or any enumerated data type (EDT) you care to define. Given appropriate definitions, the following loops are all valid:

```
FOR indx := 20 TO 30 DO < statement >;
FOR ch := 'A' TO 'Z' DO < statement>;
FOR flag := false TO true DO< statement>;
FOR day := friday DOWNTO monday DO< statement>;
```

Now we can see better why there is no *step* capability. Mixing numeric and nonnumeric values could be very confusing, especially for compiler writers. Besides, there is something clumsy about a statement like

```
FOR month := january TO december BY 2 DO< statement>;
```

while the statement

```
FOR month := january TO december BY february DO
< statement >;
```

doesn't make any sense at all (especially since *ord(february)* equals 1, not 2).

A last comment: as with the *if..then..else* construct, you can substitute a block statement for < statement>, to wit:

```
FOR indx := 20 TO 30 DO BEGIN
   < statement1>;
   < statement2>;
   .
   .
   < statementN >
END;
```

Conditional Iteration. Since the *for..do* loop can't easily meet all our iterative needs, Pascal gives us two others, both controlled by boolean expressions. The first is the *while..do* loop:

```
WHILE < boolean expression >
      DO < statement> ;
```

This loop will cause < statement > to be executed as long as < boolean expression > resolves to a value of true. It will never be executed at all if < boolean expression > is initially false.

If you wish, you can replace *for..do* loops as follows:

```
< variable > := < expression1>;
WHILE < variable> <= < expression2 > DO BEGIN
         < statement1 >;
         < statement2 >;
         < statementN>;
         < variable > := succ(<variable>)
      END;
```

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If you want to use a step value, then you need to change the last statement to reflect that. Here, for example, is a loop that tests to see if *score* falls within a given range:

```
low :=0;
step := 100;
maxscore := 30000;
WHILE low <= maxscore DO BEGIN
  high := low + step-1;
  IF (low< = score) AND (score< = high) THEN BEGIN
    writeln('Your current score is between');
    writeln(low,' and ',high);
    low := maxscore + 1
  END
  ELSE low := low +  step
END;
```

The other conditional loop is a *repeat..until* loop. It uses the format:

```
REPEAT
  < statement1>;
  < statement2>;
  .
  .
UNTIL < boolean expression>;
```

The statements inside the loop are executed as long as< boolean expression > is false; in other words, this construct is just the opposite of the *while..do* loop. It also differs from the other loops in two important respects. First, the statements inside of it will always be executed at least once, since no test is made until the end of the loop. Second, unlike the other structures we've seen, it can accept multiple statements without the use of a block statement. For example, the following loop doesn't need *begin..end* bracketing of all the statements inside:

```
count := 0; maxguesses := 10;
REPEAT
  write('enter your guess: ');
  readln(guess);
  IF guess = actual
    THEN writeln('you found it!')
  ELSE BEGIN
    count := count + 1;
    writeln('nope, missed again');
    IF guess > amount
      THEN writeln('you were too high')
      ELSE writeln('you were too low')
  END
UNTIL (guess = actual) OR (count = maxguesses);
```

This loop gives you ten chances to guess the value of *actual* (assumed to have been randomly set). If you guess wrong it tells you whether you're too high or too low, and it continues until you have either guessed the right number or run out of guesses.

More To Come. We haven't yet discussed the *case* statement; we'll save that for next month. Next month you'll also get a sample program using everything discussed to date (and a little more). Please feel free to write and let us know how much you like us. Send comments to Softalk/IBM Pascal, Box 60, North Hollywood, CA 91603.

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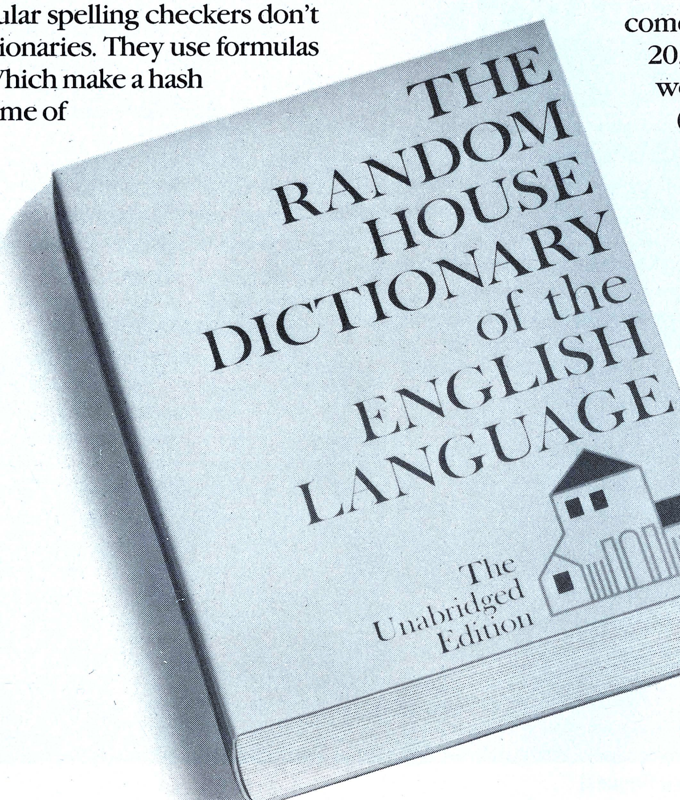

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The Holiday Inn on Union Square—415-398-8900—480 Sutter St.—a modern facility with all the conveniences, and located in the heart of San Francisco. This facility offers CP/M '83 attendees accommodations for $70 per night single and $80 per night double.

The Holiday Inn Financial District/China Town—415-433-6600—750 Kearny St.—this high rise Inn is six easy blocks to Moscone and offers CP/M '83's attendees single or double accommodation at $55 per night versus their regular rates of $78 to $92.

The Pickwick Hotel—415-421-7500—85 5th St.—Just two blocks from the Show, this fine hotel has clean modest accommodations, and is offering CP/M '83's attendees rates which are lower than motel rates. The rates are $30 per night single and $35 per night double, and can't be beat anywhere in town.

Make your reservations today. Over 20,000 are expected to attend CP/M '83.

Hotel Reservation Request

How to Make Your Hotel Reservations

1. For you to receive CP/M '83's special discount convention rates, all reservations must be made on this form, or a facsimile. The form must be completed in detail, including date and hour of arrival, date of departure, and names and addresses of all persons who will occupy the room. Reservations can not be processed without this information.

2. Indicate at least three choices of hotels and rates. Requested rates cannot be guaranteed, but the Housing Bureau will make every attempt to assign rooms as near as possible to the requested rate.

3. The Housing Bureau requires written reservations. Only late requests, after Friday, January 7, will be accepted by telephone. After Friday, January 14 try to make your reservations directly with the hotel, but be advised that the hotels are expected to be full by that time. The Housing Bureau telephone number is 415-626-5500.

4. Mail this hotel reservation request directly to CP/M '83 Housing Bureau, P.O. Box 5612, San Francisco, CA 94101, and *not* to National Computer Shows.

5. Confirmations will be sent from the Housing Bureau up to two weeks prior to the event. Allow up to two weeks for processing.

6. Cancellations. Notify the CP/M '83 Housing Bureau of all cancellations up to Friday, January 7. After January 7, make cancellations directly with the hotel.
   Changes. All other changes, such as arrival or departure times or changes in type of accommodations required, should be made directly with the hotels at all times.

7. Hotels will hold reservations only until 6 pm unless otherwise requested. If you are delayed in transit, phone ahead and advise the hotel of your arrival time. Reservations can be guaranteed to assure a room regardless of arrival time. However, if you do not pick up or cancel the reservation, you will be billed for one night's room rate. If you make a reservation, even a guaranteed reservation, it will be held only for that night. Thus, if you designate a Monday arrival and do not arrive until Tuesday, you will not have a room unless you notify the hotel beforehand.

Hotel Reservation Request

A. Please make the following hotel reservations
Hotel Choice
1st ______________________________
2nd ______________________________
3rd ______________________________

B. Please enter my reservation at the hotel for
______ single room(s) at $________/ day
______ double room(s) at $________/ day
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______ two bedroom suite(s) at $________/ day

C. Arrival date ________ time ________ ☐ am ☐ pm
Departure date ________ time ________ ☐ am ☐ pm
Occupant ______________________________
Share With ______________________________

D. Mail my confirmation to
Name ______________________________
Firm (if any) ______________________________
Address ______________________________
City ____________ State ________ Zip ________
Telephone (Area Code) ______________________________

E. Complete this form and mail to CP/M '83 Housing Bureau, P.O. Box 5612, San Francisco, CA 94101

JOHN DRAPER

THE HARD RIDE TO EASYWRITER

by Jonathan Miller

"I don't go by a twenty-four hour day," says the defiant, high-pitched voice. "I go by my own day."

John Draper, the self-styled maverick programmer, is behind the wheel of a Cap'n Software company car, demonstrating his commitment to life in his own lane. The programmer who writes code as if he were a program executing is back on line, racing between his Oakland pad and a health-food restaurant in the college town of Berkeley, his favorite stomping ground.

He is upset. The general street layout between the two East Bay cities doesn't compute. All the major thoroughfares are running counter to the direction he wants to go in, and he is running late. A midcourse correction is immediately called for and executed—a zigzag detour down a maze of side streets that eventually leads to a hopelessly congested intersection on Telegraph Avenue in Berkeley.

Draper is humming now, just as he is when he programs all night to the pulse of homemade music tapes, and no glitch in some flawed traffic system is going to foul his timetable. Without hesitating, he resolutely swings the Honda sedan through the lot of a corner service station, performs a cute little U-turn, narrowly misses a pedestrian, muscles his way into the far right lane, and voila—he's northbound again, back on schedule.

Keeping to schedules and making lists. They're at the core of Draper's curious being. He may look like a latter-day hippie who forgot to change clothes, but this bearded programmer is the soul of organization. He is time personified. Time is his most precious possession and woe to the intruder who wastes it. He reserves one to three days a month to deal with the nine-to-five world, but even that sounds like a tremendous sacrifice.

"I try to get myself removed from that as much as possible," says Draper. "I want to concentrate all my energies toward programming, because I'm only one person—me, myself, and I. I'm competing against a staff of maybe fifty programmers and I just don't have the time."

Today he's making some time. He is making the time because he's combining business with another of his pleasures—food. Draper likes to eat, and anything he likes he takes seriously, as he demonstrates with a smart listing of his menu program—a house specialty sandwich with lots of avocado and crab; sprouts instead of lettuce; a glass of ice water with lots of ice; a Power-plus shake and, yes, some of those fine dinner rolls with extra butter. He has asked to be seated on the restaurant patio to avoid any possible contact with cigarette smoke.

Cigarette smoke is a big issue with Draper, because the fumes make him nauseous. It's an aversion that dates back to childhood, when the family was following the transitory career of the elder Draper, a career Air Force officer, and John was seeing four high schools in four years. Somewhere along the line John became allergic to smoke, although no one realized it at the time. To his parents, both smokers, John's attacks were a great annoyance, particularly when the family was traveling by car. Draper still gets upset thinking about it.

The Hardships of Success. There'll be no smoke to deal with today out on the restaurant patio. But there is a fire of sorts—a matter, in fact, of more critical concern than human chimneys: Draper's livelihood as an independent programmer. Independents like him are being squeezed from two sides. From the larger software houses with their packaged goods and Harvard MBAs and, yes, from their very own publishers.

In Draper's view, he's in danger of becoming the Rodney Dangerfield of programming—no respect, and, even worse, not enough money. John Draper, seventies folk hero, author of *Easy-Writer 1.1* and a gray eminence in the industry at age thirty-nine, sees the industry changing in ways that make him uncomfortable. In particular, he's begun to feel the threat of competition from the publisher of his best-known program, Information Unlimited Software.

Speaking of his situation vis-a-vis IUS, Draper seems uncertain of how threatened or angry he wants to sound. "I don't want to alienate them," he begins, trying to sound conciliatory. "I don't want to hurt anybody. I just want to make sure that I get what I deserve. I've been exploited heavily in the past and I'm tired of it. I want to turn that around."

Draper has had some other things to turn around in his life. Some ten years ago, before the dawning of the microcomputer era, he achieved a notoriety that he's been trying recently to live down. As Captain "Blue Box" Crunch, the counterculture hero annointed as king of the phone phreaks, Draper used a toy whistle and an amazing tool, his magic blue box, to freely roam a global village of telecommunications. It seemed like such great fun at the time, tweaking Ma Bell and an already discredited establishment with a whistle from a Cap'n Crunch cereal box and a hand-sized electronic device that literally put the world at his fingertips.

The media loved it, blind youngsters "felt" each other with it, Apple inventor Stephen Wozniak demonstrated it, and John Draper went to jail.

The court was unimpressed with Draper's contention that he did it for the electronic knowledge, that the free call to Sydney to dope out the top ten tunes was critical to his education.

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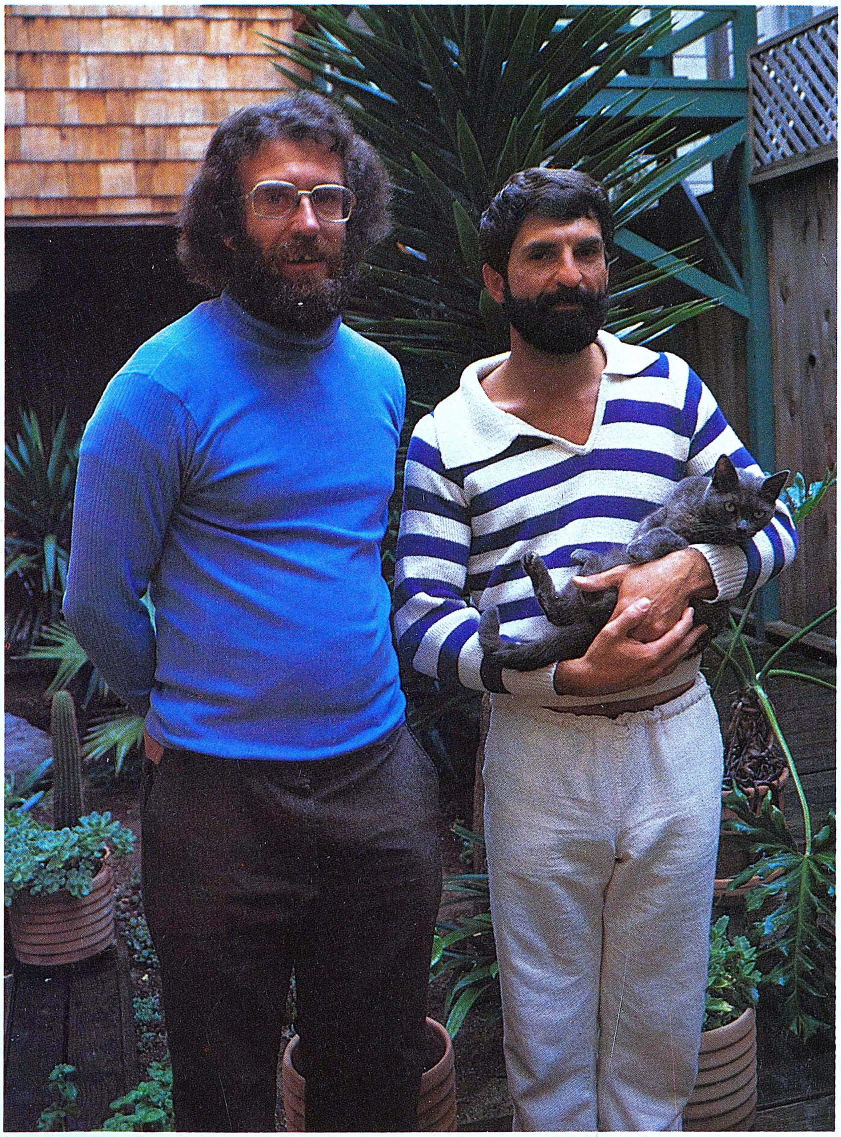

John Draper, Matthew McIntosh, and friend.

"Your electronic gymnastics may have been thought to be a prank, a frivolity, or a harmless vocational endeavor," said an unamused federal judge in 1972, "but on the next occasion—if ever there is one—you will receive a prison sentence." And when there was one, in 1976, federal officials made good on their promise. Draper became an example, the first phone phreak sent to prison.

He spent four months in a low-security installation at Lompoc, California, the temporary residence at about the same time of certain of the nation's political luminaries. Upon emerging from Lompoc, Draper applied his creativity to another goal: by the seat of his pants he became a computer programmer.

Writing EasyWriter. Not one to sell his talents short, he set out to write the first word processing program for the Apple II. This was a prodigious undertaking back then, particularly for someone largely self-taught. Draper's experience until then consisted of a four-year hitch as an Air Force radioman, a few college electronics courses, and assorted Bay Area engineering jobs. "I didn't know exactly what a word processor was," he recalls. "I had to learn."

Not only was Draper charting new ground in software, he was trying it in Forth, a difficult language whose lack of syntactical constraints appealed to Draper's freewheeling spirit. "He just wanted to do things without knowing what he was doing," says Wozniak. "For example, he sat down [at the Homebrew Club] and said, 'Hey, I'm going to write a cross assembler.' Of course, he didn't know what an assembler was. If you've never used an assembler, you don't know where the rest of the world is or how it's done."

Draper eventually learned about assemblers, and he eventually produced a word processor. It may not have been "truly optimized," as Draper says, but it did what it was supposed to do and did it fairly fast.

EasyWriter made a name for itself in the marketplace. It also made some money for Draper and his new publisher, IUS. When IBM decided to enter the personal computer field some two years ago, it approached IUS president Bill Baker about producing an enhanced *EasyWriter* for the pc.

Baker can only speculate about why IBM came to him. He figures they were looking for an established firm and an established product in the moderate price range. They were playing catch-up in the microcomputer field, and they needed software in a hurry.

"There was a very definite time crunch," says Baker regarding the debut of the pc. "The BIOS wasn't finished, IBM's DOS didn't work, and they didn't have the rights to give us other information we needed to do the job. We were getting DOS changes almost every day from IBM. We didn't even know what the keyboard would be like."

Extenuating circumstances notwithstanding, Draper's program played to largely negative reviews when it was released in August of 1981, along with the computer and a few other name-rated products—*VisiCalc*, the Peachtree accounting package, and Microsoft's version of the original *Adventure*.

Draper concedes that the program was slow. Embarrassed by its reception, IBM, IUS, and Draper steeled themselves to a thorough revision and in May of 1982 published a much improved and, according to Draper, largely ignored successor, *EasyWriter 1.1*.

"It's a lot faster than *WordStar*," he claims, "but people simply don't know that it is." And they don't know, he continues, because it is being overshadowed by Son of *EasyWriter*, version II. This is the high-end, Wang-like system published by IUS that Draper didn't write, didn't want, and doesn't need.

"As soon as I learned about the *EasyWriter II* program—and I was never informed it was coming out until the brochures were printed—I told Bill I'd very much like it if he would not sell *EasyWriter II*," Draper says. "I feel I have a right to know if my software publisher is publishing a program that could be in competition with my program, and that's basically the bottom line."

Baker, who holds the proprietary rights to the *EasyWriter* name, maintains that no injustice has been done. For one thing, he says, the programs are not in direct competition: file-oriented *1.1* sells for $175; page and document-oriented *II* sells for $350. Secondly, Draper's program is not being buried.

"It's not as though it's lacking attention," Baker explains. "It's just lacking direct attention from me, because we licensed it to IBM and they're the ones in charge of the marketing. And they're doing a good job."

John Draper, the hyperkinetic programmer, is getting into it. He is squatting in a jacuzzi, hands clasped, arms outstretched, swinging his arms in widening arcs through the roiling water. At the moment at least, he is at peace, his problems with IUS and his chronic lower back pain momentarily forgotten in a pampering plume of steam. He has kept faith with his daily exercise program (yoga, acupressure and shiatsu), and now he's executing a nifty subroutine for a little R&R. In the recreational facilities of his high-security apartment complex, which he has all to himself this afternoon, his intense blue eyes are smiling and Draper is speaking, speaking in that excited, boyish voice of his. "This is how come I write such good code," he crows. "I know how to relax."

His utterance loses some of its impact when he abruptly jumps up and bounds for a quick dip in an adjoining pool, announcing as he flies that he performs this recreational loop not once but several times, very much to schedule. Relaxation, however, is a relative term, particularly in the case of a human comet—a man whose faraway gaze suggests he's out to lunch in some private corner of the universe.

"That's just John," laughs his Cap'n Software business partner, Matthew McIntosh. "He's just out there."

Where that might be exactly is open to debate. In strictly physical terms, it means Oakland, the place once said to have no there there. In business terms, it means San Francisco, where Cap'n Software is headquartered.

Draper and McIntosh are purposefully vague about their product plans—four programs in the music and graphics areas, they allow, along with a color text editor for serious programmers. And they're no clearer about their marketing direction, either. Maybe they'll go it alone, maybe with somebody else, but lest anyone misinterpret their promotional inactivity, they're still out there.

Strange Tools. It is out there in Oakland where many of these questions will ultimately be answered. For it is there, in an apartment crammed with all manner of electronic gear, that Draper performs his programming tricks, using what he mysteriously calls his "strange and radically different tools."

"I treat programming as if I were an algorithm," he says. "In other words, I'll write a program as if I am a program executing, and that's a different concept of programming."

Draper has programming down to a routine. It's a ten-step sequence of coding, listing, and flow charting that begins with a play period—with Draper giving his imagination free rein as he drops out and tunes in to one of his many music tapes. Music is Draper's tranquilizer, his creative catalyst.

He does much of his designing over in the smoke-free environment of Berkeley's Cafe Ren (as in Renaissance), listening to the classics and getting wired on potent espresso. For the "drudge and grunt" work that follows, like debugging, Draper opts for mellowing rock. He programs mostly at night, on occasion going two or three days with little or no sleep to wrap up a particularly large routine.

If he really has some serious programming to do, Draper goes into hiding. When he was brainstorming *EasyWriter*, he packed up his computer and went to Acapulco for a week, completing at least a month's work in that time. The Mexican resort was the perfect retreat for a warm-weather phreak. "I couldn't make contact with the people down there because I didn't know the language," he recalls. "I'd go out and lie in the sun and then I'd come back and write code. I'm the solar-powered programmer."

Draper learned programming by sharing time on larger systems, and that profoundly affected his programming style. To this day, he prefers to keep his actual computer time to a couple of hours a day, a style for which Forth seems particularly suited. The language obliges the programmer to enter code correctly the first time, because it doesn't ordinarily support error-checking routines.

"Forth is a language that forces you to do structured code," says Draper. "I agree with Ken Harris, who says 'Forth is like an amplifier: it makes a bad programmer worse and a good programmer better.' "

Forth, of course, is Draper's principal tool. It's his secret weapon, the key that unlocks the electronic universe beyond his CRT looking glass. Independent-minded programmers are drawn to Forth because it's flexible, compact, and fast, says Draper. Forth shines because it's machine independent; it's both a language and an operating system, which means it can be easily transferred from one machine to another.

"If a brand-new computer hits the market, you don't need any operating system to implement your applications package," says Draper. "We can get our software up and running on the new machine by cross compiling, downloading it from an existing Forth system. I don't care to know what computer system I'm on. Right now, all of my system software can be interconnected from different computers. No one else can do that," he says; "no one."

Author! Author! But the overriding issue, according to Draper, is whether he's going to be able to show his tricks and wares in the pinstripe age adawning. Writing programs is like writing a novel, he says: they each require a language and a publisher. And as luck would have it, Draper has been having trouble on both counts. The large software houses that increasingly dominate the marketplace are redefining the programming and language rules, he says. They're crowding out the independents by a variety of means—limiting access to operating systems and compelling the use of a handful of languages in which they have a vested interest.

"I don't want to write in Basic," Draper grumbles. "I want to write in Forth. I need as many tools as I can get my hands on because I'm competing against a company with fifty programmers."

And then, to strengthen the analogy with print, there's the endless publisher/writer debate over editing, over the balance between artistry and marketability.

"Distributors are always going to want to change your application packages," Draper allows, slipping into an imagined conversation between himself and a publisher. " 'Well, gee, I don't like the way the menu looks,' or 'I don't like the way it's working.' Or 'can you do it this way, can you do it that way?' Publishing software is the same as publishing a book, which means when I write a program I have to write it in such a way that it's easy to change."

But Forth, whatever its virtues, is not generally regarded as simple to change. The prevailing view is that it cannot be easily rewritten and maintained by other programmers, and this shortcoming makes it unattractive to large software houses with team approaches to engineering.

Draper disagrees with this view. "Forth is maintainable," he avers. "It just requires discipline in the art of joint documentation and coding." He also implies that the resistance to Forth is really prompted by fear and, yes, greed.

"I'm using a language that they're afraid to use because it's too powerful," he asserts. "The industry has put so much money and energy into operating systems—Digital Research's CP/M and Microsoft's MS-DOS—they're not willing to change. They're not willing to drop down to a simple Forth concept."

So about all Draper can do, therefore, is sound the alarm and urge a return to the Aquarian age of computing, circa 1976, when information was freely exchanged. "Our message to all those big computer companies is this: 'Make your systems open. You'll make more money and you'll reduce the cost of software because you've made the job easier for the programmer.' "

In the meantime, John Thomas Draper will carry Forth, out there wherever he is. He'll explore the possibility of underwriting a software think tank, where independent programmers can "live in a nice, comfortable environment with access to all kinds of computers and do creative things." And, of course, he'll still be out there trying to tune in to the programming needs of the people. With a little luck his genius may flash again.

"When John's feeling good about John," says Baker, "he can make computers do things you never thought they could." ▲

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There are important differences. As a buyer of software, you're reacting to advertising, word of mouth, your unique applications, and your dealer's counsel. As a user of software, you sit as judge and jury on a daily basis as to whether what you purchased is actually performing in the manner you desire.

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There's no time to lose. We'll be making a presentation to the winner at the West Coast Computer Faire in mid-March, which means we need your ballots now. To make it even easier, we'll pay the postage. Deadline for mailing is February 15, 1983.

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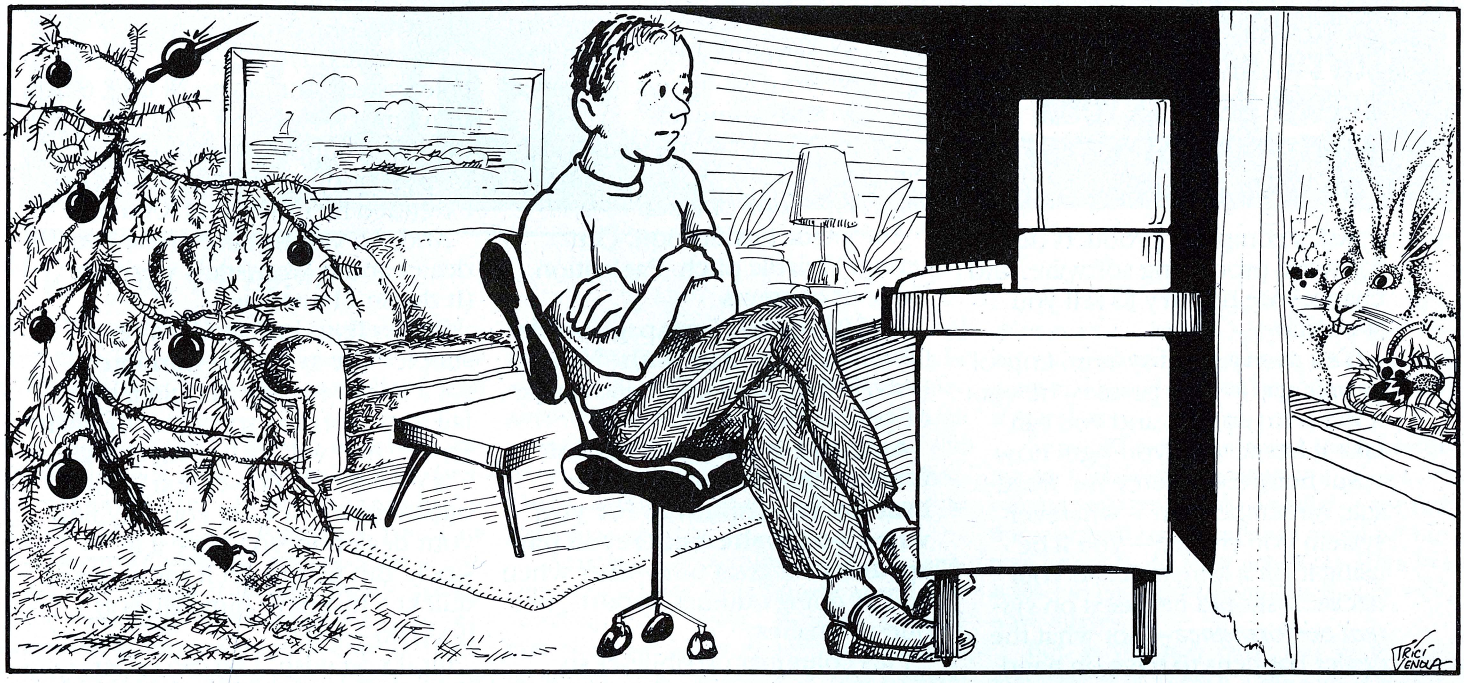
This is your chance to talk back to the industry by registering your after-sale opinions on software. Seize it.

The rules are simple:

1. All software packages for the IBM Personal Computer available for sale before January 1, 1983, are eligible for votes.
2. You may nominate any number, up to ten, of packages as meriting consideration.
3. Order your nominations with your favorite program first, followed by the second favorite, and so forth.
4. Use the blank space for any comments, complimentary or derogatory, that you wish to make about the products on your list or the products you left off the list.
5. Stuff your postage-paid ballot in the mail immediately to make sure your votes get counted.

The winner will be announced at the West Coast Computer Faire; total results of the voting will be printed in the April issue of *Softalk*. ▲

When Is Cloud Nine?



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Quite simply, PowerText will do far more for you than Wordstar.

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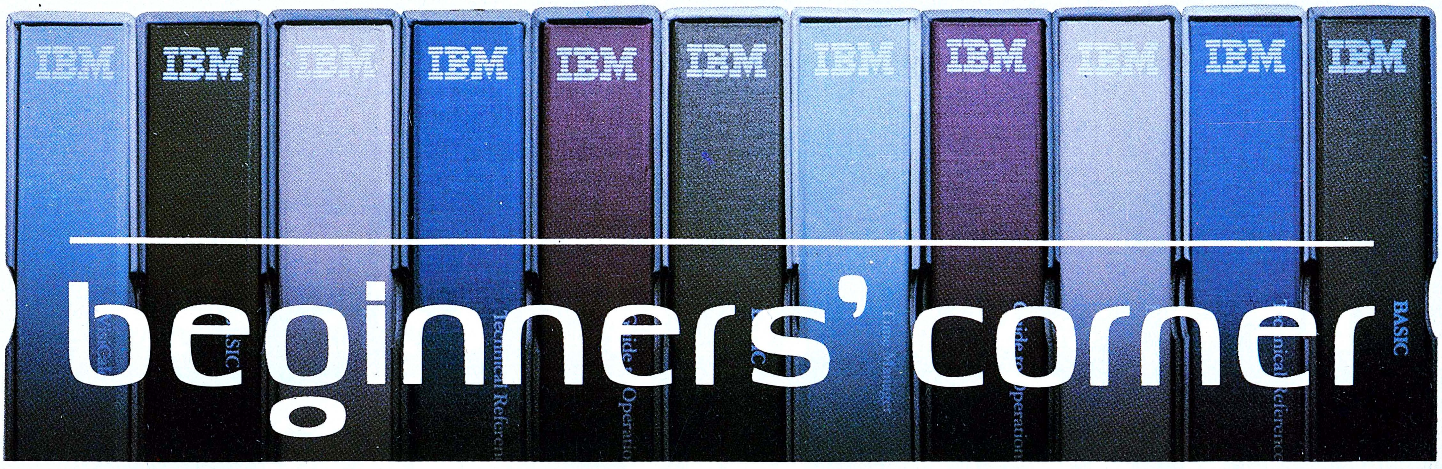

beginners' corner

by Craig Stinson

When this column last appeared, in November, we were addressing ourselves to the distinction between compilers and interpreters.

All programs written in high-level languages, you'll recall, have to undergo translation before they can be run on your computer. That's because computers, which are fundamentally stupid, only respond to two kinds of signals (computer people usually call these signal types *zero* and *one*, for reasons we'll discover before too long). High-level languages like Basic and Pascal, on the other hand, are made up of symbols that at least approach human-readability.

Compilers and interpreters are themselves programs that have already been translated into a machine-readable form (into the appropriate strings of zeros and ones). Their functions are identical: to translate other programs—programs that *you* write or that you procure for some application—into a form that can be executed by the computer. But compilers and interpreters go about their work in different ways.

An interpreter stands by while your high-level program is running and translates it line by line into machine code, more or less the way Jaime Jarin might translate a conversation between Vin Scully and Fernando Valenzuela. When, for example, you want to run the Basic *Samples* program provided on your DOS disk, you first load the high-level code that represents that program into a certain region of memory (the address of which is controlled by the Basic Interpreter). The Interpreter, meanwhile, stands by in a different part of memory.

When you type the command word *run* and hit the enter key, the first line of *Samples* is in effect passed up to the Interpreter. The Interpreter *parses* the line to make sure there aren't any syntax errors in it and then converts the line into machine-readable form. Finally, it passes the digested, translated code to the 8088 for processing.

The process is unimaginably fast, but it nevertheless takes time. If the high-level program happens to have lines that need to be executed more than once (most useful programs do have such repetitive processes), the repeated code will have to be reparsed and retranslated each time it's to be executed. That's hardly the most efficient way to translate a program.

A compiler, on the other hand, is a translator who refuses to be present at the conversation but, instead, demands to have everything submitted in writing. Compilers take high-level instructions and convert them en masse to machine language, before the program is run. The converted, machine-readable code is sometimes called *object* code; it can be stored on disk and run again and again without requiring additional translation.

Improved execution speed is one reason many high-level programmers prefer to compile their programs. Another is the fact that compiled code is relatively hard for human beings to decipher and is therefore less subject to the depredations of would-be software thieves.

But, as you may recall, one of the reasons that Basic is such a popular programming medium, particularly for first-time computer users, is precisely the fact that it's

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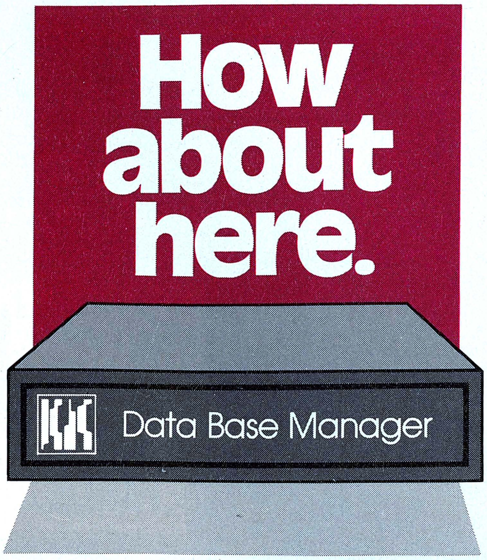

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York Company	34569	80
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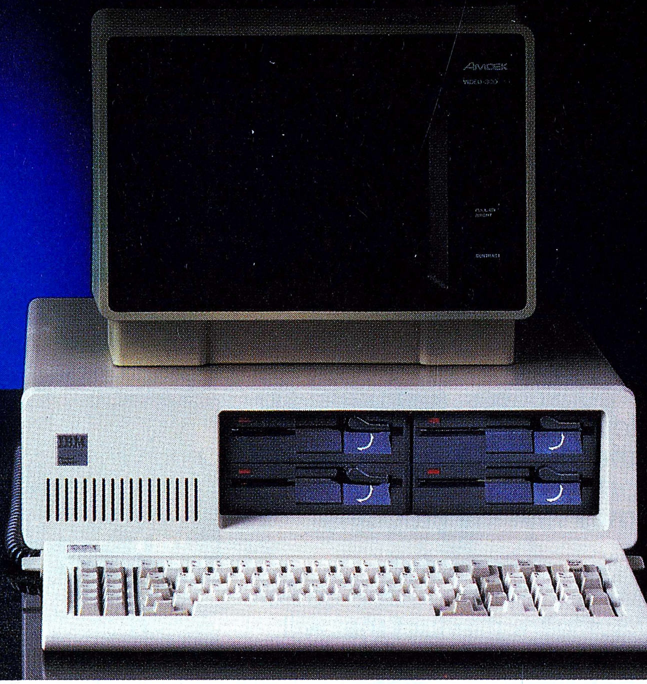

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usually implemented as an interpreted language. Why is that, you may ask?

Because the Basic Interpreter allows you to develop programs a piece at a time. You can write a few lines of code, then type *run* and see how they perform. If you don't like what they do, you can change them a little—tweak them, as they say—and run them again.

If a finished program gives you fits, because all your logical faculties tell you it ought to run perfectly and it doesn't—and, what's more, you haven't the foggiest sense of where the trouble lies—there are a number of ways the Interpreter can help you *debug* your code.

Recall that Basic does not oblige you to type program lines in the order in which they're to be executed. You merely assign a number to each line of the program, and the Interpreter executes the lines in ascending order (unless it reads a line that tells it either to retrace its steps or to jump off to some remote segment of the program). If you exercise a little foresight and number your program lines at intervals of say, ten, then you can later come back and add lines between the lines, so to speak. Being able to interpolate in this way is handy in case you happen to leave something out of your program by mistake; it's also handy for debugging.

Let's suppose you suspect that line 450 is sending your program awry, but you don't know for sure. If the next line is numbered 460, you can add the following:

```
455  STOP
```

and type *run*. The program will halt as soon as it's finished executing line 450, giving you a snapshot of your program at that point in the code. After you've checked its status at that point, you can start it running again from where it left off, by typing *cont*.

If you wanted to, you could put stop codes between every two lines of a program. That would, in effect, give you the opportunity to look at a motion picture one frame at a time. Erasing the stop codes later, when you've figured out how to fix your program, would be a painless procedure.

Most interpreters offer another kind of debugging facility, called *trace*. If you run a program with the trace feature turned on, the Basic Interpreter will display on your screen the number of each line in the program—as it executes that line. If your program blows up someplace, trace will often help you discover where.

You can turn trace on by typing *tron* when you're facing the Basic Interpreter's Ok prompt. Trace will stay in effect until you turn it off (or until you leave the Basic Interpreter, by typing *system*). The command to turn off the trace function is—no surprise—*troff*.

Neither the stop-frame approach to debugging nor the trace approach is practical if you have to send your program back to the compiler every time you make a change to it. A good compiler will help you find problems in a program if those problems are of a syntactical nature; but in the all-too-common situation where the syntax is right but the program still doesn't behave, an interpreter is a handier tool.

Something else that's handy about your Basic Interpreter is that it allows you to use your computer in what's called the *direct* mode (some books call this *immediate execution* mode).

What this means is that you can use your computer as if it were a calculator. Practically any command that you can put in a Basic program you can also type *without* a line number; a command without a line number is carried out by the Interpreter forthwith. So, for example, if you just want to add up your tax bill, you don't need a program; get into Basic, type *print* followed by the appropriate numbers and the appropriate arithmetic symbols, hit enter, and the dreadful figure will appear.

To summarize, the advantage of an interpreter is that it creates an interactive programming environment. Plainly put, that bit of computer buzzology means that you can get right in there and talk to your machine and it'll talk right back at you.

One reason why most of the early high-level languages, like Fortran, were compiled rather than interpreted is that interactivity in those days was not at all practical. In the first place, programmers generally addressed their machines by such clumsy means as punched cards or paper tape. And their computers usually responded over clunky Teletype terminals at a blazing ten characters per second. Video monitors and television sets attached to computers didn't become commonplace before the middle seventies.

The larger obstacle to interactivity was the fact that a single computer usually had to serve a horde of programmers and users. Computers then were almost exclusively large, institutional resources and communication had to be handled through the auspices of priestly attendants.

That made it tough for beginners, of course. Many's the first semester Fortran student who punched his heart out on Hollerith cards and found out the next day that his efforts had produced only an obscure error message—possibly because of a trivial typo or because a couple of cards fell out of order in transit to the machine.

In short, if power is measured in terms of execution speed alone, the Basic language and Basic Interpreter are nothing remotely like the state of computational art. On the other hand, the compromises Basic makes are to good ends: they make power accessible, to beginners as well as veterans. ▲

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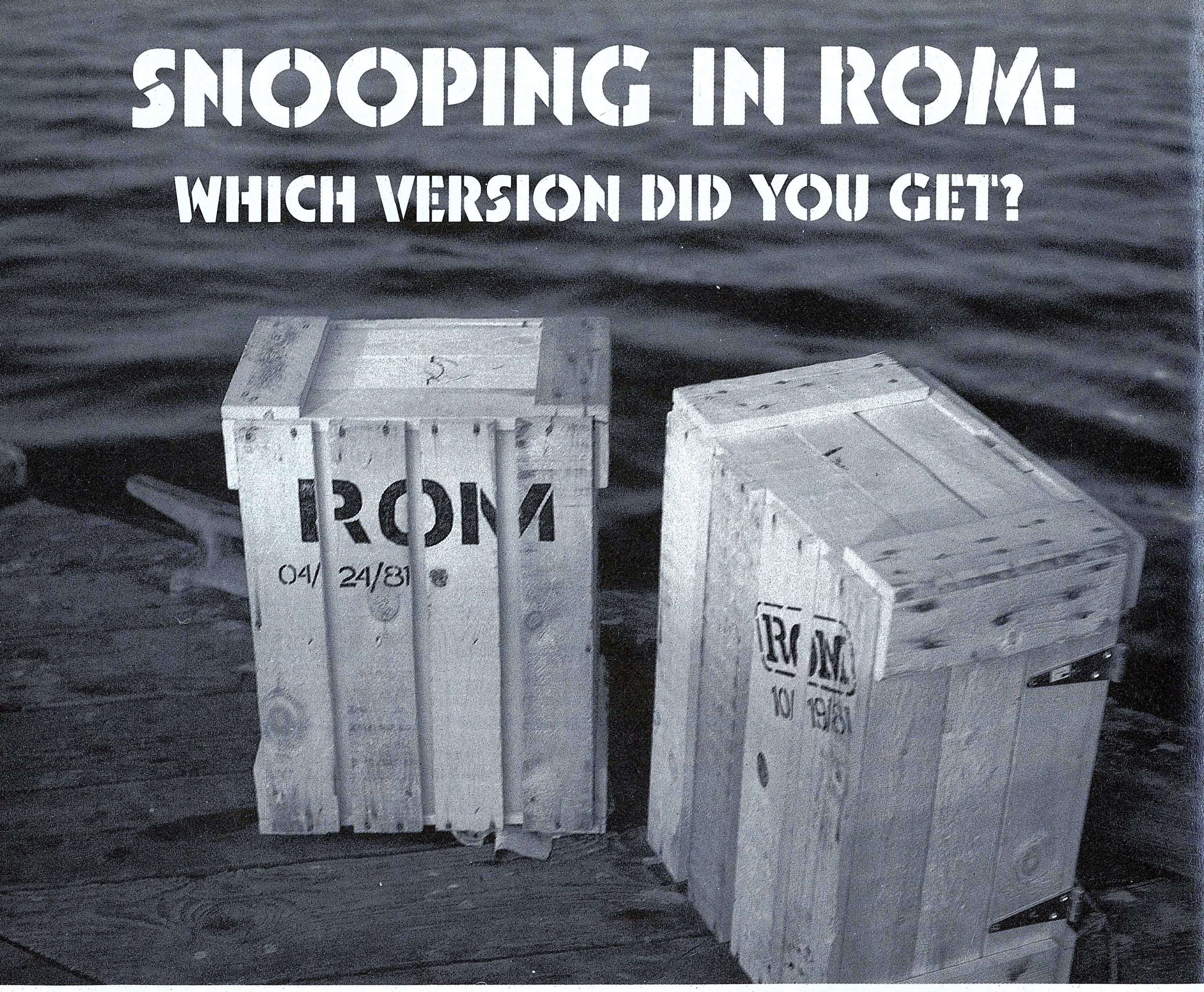

by Peter Norton

Two months ago (November 1982) we started looking at the programs located in the IBM Personal Computer's read-only memory (ROM); we covered the locations of the main parts of ROM, how to find things in ROM, and how to snoop around inside the ROM programs.

As a payoff for learning the material presented in the earlier article, this month's piece will tell you something that few people know: There are two different versions of the pc's ROM programs. We'll take a look at the differences between them and what the differences may mean to you.

Of all the programs that run on your pc, the ones that must be letter perfect, with no errors or bugs, are the routines stored in ROM. After all, if you have a bad version of DOS or *VisiCalc*, you can replace it by exchanging a disk. Not so with programs in ROM. They can only be changed by replacing the memory chips on the pc's main circuit board—not a job for the casual user of the computer. Naturally it would be a major problem for IBM if there were any major bugs in the ROM routines, so these routines were checked out and debugged with unusual care.

If you think there is any major programming project that can be done without mistakes, you probably also believe in the tooth fairy. The designers of the pc, being as fallible as ordinary humans, found several minor things worth changing in the ROM programs, so they made a revision. You might be interested in knowing which of the versions you have and what the differences are between the two.

The Date. At the very end of the ROM BIOS program, IBM placed a date stamp, called a release marker, which identifies the date that particular ROM routine was officially finished. You can use the Debug program, which is part of DOS, to find and display the date marker. To see yours, start Debug by typing the command

```
DEBUG
```

and when you get the hyphen prompt, enter the command

```
D F000:FFF5 L B
```

Debug will then display the release marker for your computer. The marker for the original ROM BIOS program will be

```
04/24/81
```

and the newer release marker will be

```
10/19/81
```

If you find some other date, then you've dis-

This article is taken from the forthcoming book, Inside the IBM/PC: Access to Advanced Features and Programming, *to be published by the Robert J. Brady Co. in the spring of 1983.*

covered still another version of ROM and *Softalk* would very much like to hear from you about it.

The version from April 1981 is the original ROM BIOS, while that from October 1981 is the revise. One point of immediate interest is that a spot check done at a Computerland store late in 1982 revealed that the old version is still being sent to customers, even though some people have already been getting the new one. Why IBM continues to sell a version it has revised and replaced, and why a full year after the revision was made some customers get the old version and others the new, are real mysteries.

One way of comparing the two versions of the ROM BIOS is by writing a program that copies the two versions to disk and then compares them, locating and highlighting the differences. If you'd like to experiment with a couple of programs that perform this comparison, write to: Softalk Snoop, Box 60, North Hollywood, CA 91603. Enclose $2 or a disk and we'll provide you with a running copy of the programs; they're quite interesting to see in action.

An analysis of the differences between the two versions of ROM BIOS reveals the following things.

You'll recall that the ROM for the Personal Computer holds two things—ROM Basic and the BIOS. What you'll discover first in comparing the two versions of ROM is that no changes were made to the ROM Basic program. Although some errors have been found in Basic, they've all been changed by means of alterations in the disk versions of Basic.

It was probably important that the ROM Basic not be changed, since changes there would affect the performance of Basic programs in ways that you, the user, could do nothing about. Some of your Basic programs might work one way on one machine and differently on another, just because of a difference in ROM. By making all changes in the disk Basic programs, IBM ensured that we would have control over any updates to the language.

If any of your programs happen to require the original Basic, bugs and all, you can run them with the original disk version of Basic. And for the new versions of Basic, the disk program can, in effect, temporarily update the read-only memory. How this is done will be explained in another article.

BIOS Glitches. All the changes that did appear in the revised ROM were in the BIOS (Basic Input/Output System), which makes up the other part (besides ROM Basic) of the Personal Computer's ROM programs. We'll review those changes here.

If you have the IBM *Technical Reference Manual*, you may have seen that Appendix A gives a complete program listing for the ROM BIOS. If you don't have that manual, don't feel lost; you'll still be able to follow along in the discussion.

The listing that appears in this appendix is of the original version, as you can see by looking at the release marker on the last page of the appendix—it shows the date 04/24/81. At the end of the appendix is a page of notes for the listing, and some of the notes are more than a little confusing. Three of them (numbers 1, 3, and 5) refer to some of the errors that were corrected in the newer version of ROM. In making those notes, IBM was providing us a clue that the ROM programs were going to be updated, although few people realized it.

Here is an outline of the changes that were made in the ROM for the 10/19/81 version, along with some information that may help you decide whether the changes matter to you.

The first three changes concern the self-test programs that are automatically executed when the pc is powered on. These routines perform fourteen tests to check for errors in the equipment, before you get a chance to wreak havoc by running programs on a faulty computer. Of these routines, number 3 tests that the timer function in the computer's memory controller works correctly. Two changes were made to this routine, apparently to make it work more correctly.

Programs that work very intimately with the hardware, as a BIOS does, are not like ordinary programs. Whether or not hardware test routines or other BIOS routines work correctly often depends on subtle characteristics of the equipment these routines control. Details of timing and of the interaction of control signals can be critical to the success of such programs. At times the only way to debug a program like this is through experimentation; logical analysis isn't enough. It's not obvious why IBM changed the power-on test routines as they did, but it seems safe to conclude the changes in some way make the routines work better.

The other change to the test routines comes in phase three of the tests; this change makes sure that the timer operation is updated before the video screen controlling interrupts are moved into place.

Don't feel lost if you don't understand the significance of those changes; they have little practical importance to a system that is operating correctly. The rest of the changes are of more practical significance.

The next change is of interest to those of you who use the asynchronous communications adapter. Among other duties, the ROM support programs for the communications adapter have to report when there is no response on the communications line. If there is no response after a reasonable amount of

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time, the ROM communications programs report a *time-out* condition. Unfortunately, because of a typographic error, the ROM routine in the original BIOS release does not report a time-out. The error was that where the number 80H was supposed to have been written, meaning the hexadecimal number 80, the H was left off, so that the value was taken to be *decimal* 80 and the wrong signal bits were set. Instead of reporting a time-out condition, the original BIOS reports that data is ready (the opposite of a time-out, if you think about it) but that the data is wrong because a parity error has been detected.

The significance of this mistake is that any communications program you use may report errors to you incorrectly. Unless it has been programmed to take the BIOS error into account, your communications program is likely to report dead lines as parity errors—and thereby mislead you into thinking that the problem is different from (and more severe than) what it really is.

Printer Problem. After that communications problem, the next error is in the printer control programs. Again the problem has to do with time-out checking. If the printer is not ready to receive data, that may be because it is busy doing work, which the computer should wait for; but it is also possible that the printer is simply not responding. The control programs in BIOS allow a certain amount of time for the printer to respond. Unfortunately, in their original version they didn't allow for the most time-consuming thing a printer might have to do—skipping to the top of a new page from near the top of a previous page. The time-out value in the original BIOS was not great enough to allow for these long page ejects, so the new version doubles the time allowed before a time-out is signaled.

After the printer, the next change appears in the cassette support programs; this one simply rearranges the order of certain instructions so as to give a slight timing change in the way that data is collected from the cassette. Since very few pc owners make use of the cassette port (and since the error is minor), this change to the ROM is insignificant.

The last change is an interesting one that affects those pc-users who have the color and graphics adapter.

Not everyone knows it, but when this adapter is used in its graphics mode (as opposed to its text mode), the pc displays characters on the screen by drawing them, just as it would draw any other graphics display. There is a table in ROM that contains the pictures corresponding to each ASCII character that might be displayed. When the graphics board is working in text mode, characters for display are generated by the color/graphics adapter circuitry. But when the adapter is working in graphics mode, the characters are produced from "drawings" stored in ROM. One of these drawings is wrong in the original BIOS.

The character that represents the diamonds in a deck of cards—the character that is created in Basic by *chr$(4)*—has an extra dot below it in the original version of ROM. The new version corrects this mistake.

None of these changes to the ROM programs is earthshaking. In fact, few users of the pc are likely to notice the difference between the old and new ROMs, even if they know what to look for. But it would have been nice to have learned about these changes through an announcement or an update to the *Technical Reference Manual*, rather than by stumbling onto them. That's the sort of thing that sends shivers up one's spine; you wonder if IBM might make more important changes and keep *them* under wraps. And it is disconcerting to find that pc systems with the old ROM are still being delivered to customers.

The next article in this series will describe how ROM routines are accessed through interrupts—how the mechanism works, why interrupts are used, and how you can override the ROM routines when you need to. ▲

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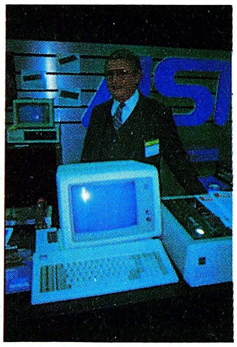
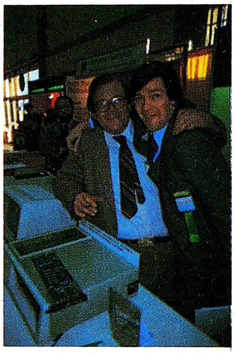
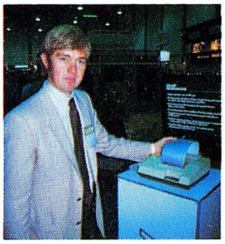
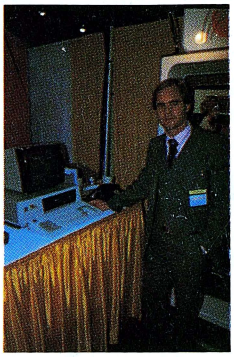
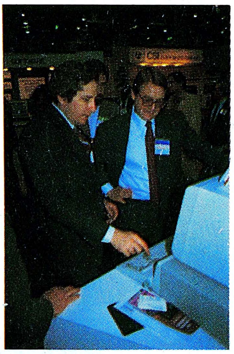
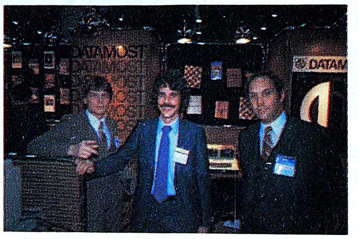


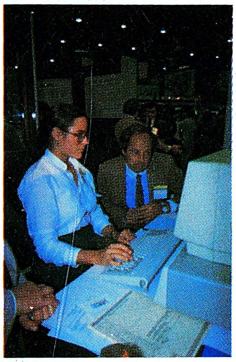


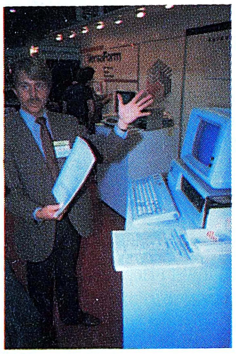


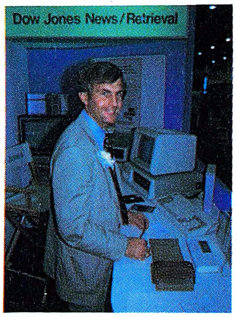


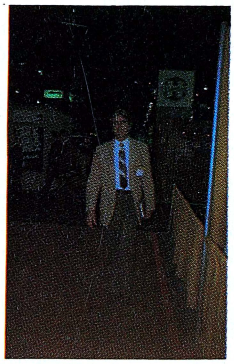






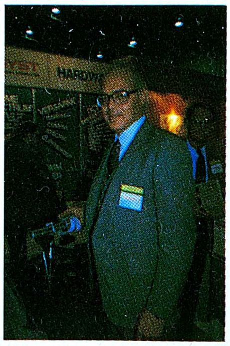
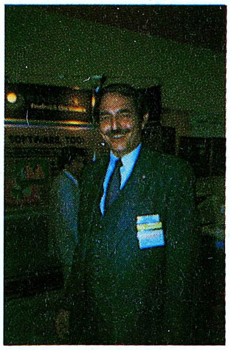


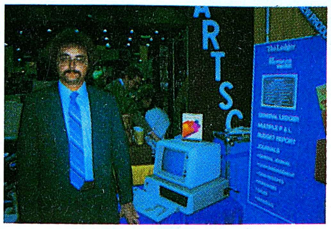




FLY SORCIM SUPERWARE

Top row, from left: the IBM booth was a mazelike affair built around lavishly appointed closing chambers. On the periphery the company demoed its pcs, Displaywriters, Systems 34, and various hardware subassemblies. Hardware abounded at Comdex. Charles H. Hughes of AST Research demonstrated memory expansion boards; Russ Mosny displayed the Byad CP/M coprocessor board (the guy on the right in the picture is Gerald Van Diver, coauthor of *Vanlove's Software Directory*); Personal Systems Technology's Don McDonald showed the Persyst memory line; Luke Ward presented the ColorPlus adapter, from Plantronics/Frederick Electronics; and Vin Raska, of Houston Electronics, showed x-y plotters. **Second row**, from left: Tecmar's Marty Alpert showed the company's line of hard disks and other expansion paraphernalia; Tallgrass Technologies offered Winchester disks with tape backup, and Simon Harrison displayed Axiom's electrosensitive printers. There was money management software to suit a variety of tastes. Jeff Jenson introduced the first two modules of Great Plains Software's *Hardisk Accounting Series*; Terry Wright, of Eagle Software, explained his company's *All Pro* series of business management programs; Ken DeYoung demoed the Westware accounting package; Randy and Lynn Broweleit with Valerie and Bruce Schooley introduced the *Business Library* from Software Libraries; and TCS's Arlene Nathan touted that company's *Total Accounting System*. Games were inconspicuous at Comdex, but TG Products offered joysticks and paddles. And, **third row**, from left, DataMost, represented by Bob Flanagan, Richard A. Bluefarb, and Hal Glickman, showed a variety of challenging game software. Database programs appeared aplenty. The Ashton-Tate booth attracted potential buyers of *dBase II*; Alice Waespy, representing Fox & Geller, showed software designed for use with *dBase II*; Elaine Haight demonstrated Link Systems's soon-to-be-released pc version of *DataFax*; MicroPro brought along *InfoStar* (displayed by James Gloystein); Joaquin Miller presented Pacific Software's *Sequitur*, and Susan Bellings revealed Stoneware's newly IBM-ified *DB Master*. Meanwhile, Tom Crispin assisted at the debut of *WordVision*, a novel, inexpensive text editor from Bruce & James Program Publishers. Of course, there was a variety of other business software as well. **Fourth row**, from left: Markham Douglas showed Applied Software Technology's *Versaform*; Eric Bradshaw presented a portfolio of Dow Jones investment management programs; Jim Howard roamed the aisles between tours of duty in the Howard Software Services booth; Sorcim was seen flying high on its *Superware* series, including an enhanced, more colorful *Supercalc*; Carol Hirsch, David Lerin, and Cheryl Moreau were among the troops giving previews of the long-awaited *TK!Solver*, from Software Arts; Mark Goldschmitt helped fan the fires of enthusiasm for Lotus Development's *1-2-3*; and VisiCorp showed that there's more than one way to integrate—with *VisiON*. Meanwhile, Laurie Lee Harper and Peachpuppet aroused interest in Peachtree's *Speachware*. **Fifth row**, from left: Al Irvine was on hand to explain the intricacies of SofTech Microsystems's p-System, with assistance from Douglas T. Ross, of the parent SofTech; Rita Anerin displayed Supersoft language compilers; and the likes of Cye Waldman (Structured Solutions) and Alan Boyd (Microsoft) cruised the floor, taking it all in.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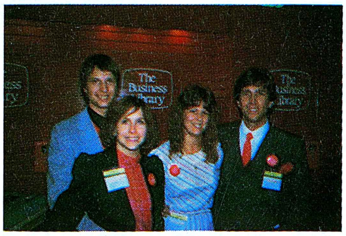
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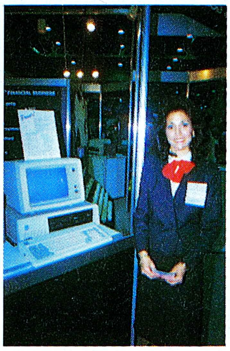
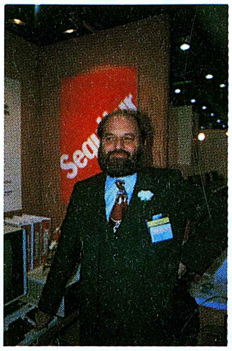
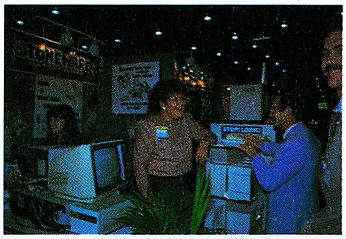
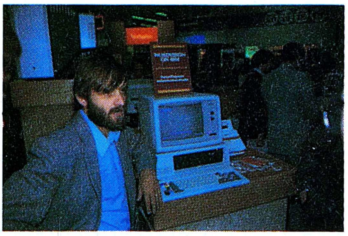
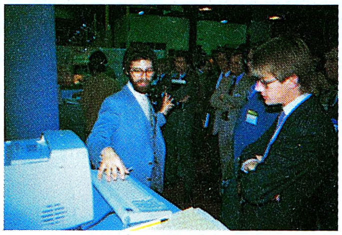
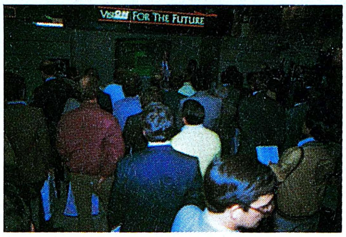
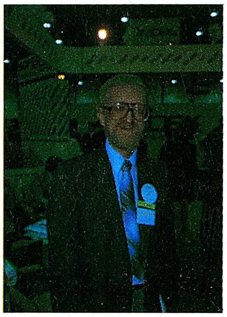
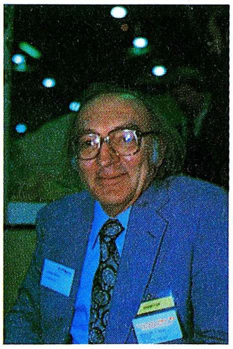
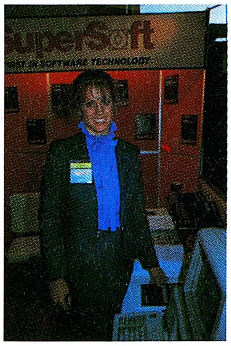


Creator of VisiCalc and TKISolver
Software Arts, Inc.


VisiOn FOR THE FUTURE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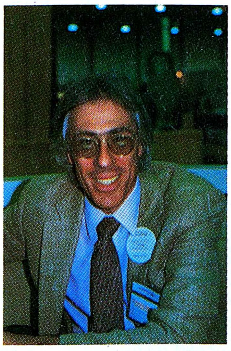
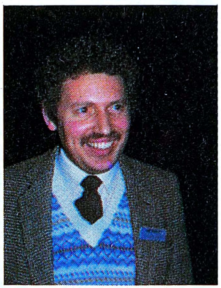
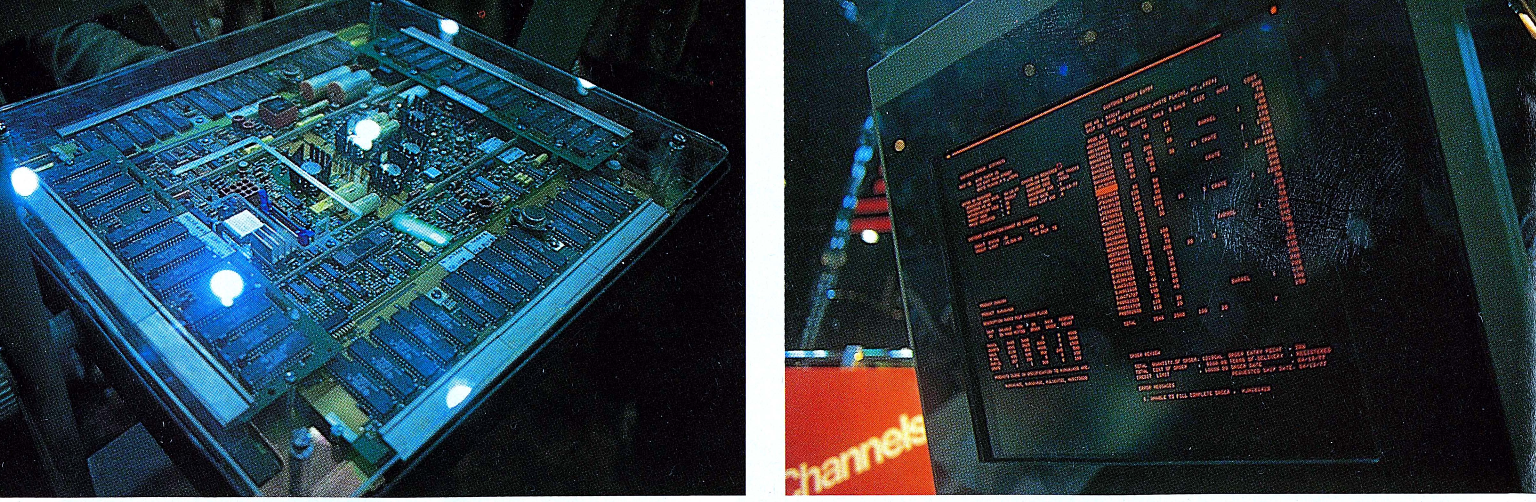



The View from Comdex



IBM offered OEMs a 960-by-768, all points addressable, plasma display subassembly. The display, shown here connected to a Personal Computer, is available at a single-quantity price of $4,500.

The View from Comdex

by Craig Stinson

Certainly the most impressive thing about 1982's Fall Comdex was the sheer magnitude of the event.

For four days in late November and early December Las Vegas fairly staggered under the impact of the computer world. Taxi lines at the airport and the convention center ran as long as forty-five minutes, hotels hung out no vacancy signs, doormen put away a killing in tips, and every other aspect of the local tourism industry enjoyed a badly needed reminder of what it was like to live in a healthy economy.

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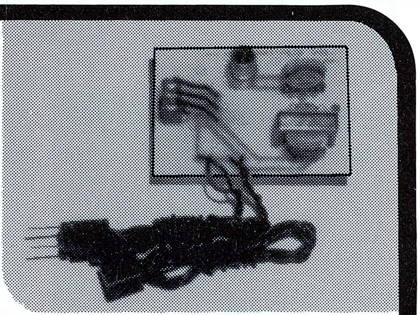

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The city teemed with computer people—vendors, dealers, users, news people, and a few of the merely curious. You couldn't get away from them. Even in the buffets and at the gaming tables, you were as likely as not to find yourself sitting next to some guy who wanted to talk about disk drives or the new IBM lookalike machines. Billboards along Paradise Boulevard and the Strip, the main corridors between the action and the airport, shouted down imperatives to buy—not automobiles and booze, but software and hardware.

When it was nearly over, Las Vegas Mayor William Briare walked into the room where conference director Sheldon Adelson was selling booth space for next year's show and presented Adelson with a key to the city.

Adelson's organization, the Interface Group, counted something over 50,000 noses at the show, including exhibitors, attendees, and the press. Eleven hundred and six companies showed their wares—easily a record for a computer show, according to the Interface Group.

Here Come the Portables. For the IBM Personal Computer owner, probably the most interesting items of the show were the several portable computers claiming IBM pc compatibility and a couple of new and dramatically distinct approaches to software integration, from Lotus Development and VisiCorp.

The IBM knockoffs were from Dynalogic Info-Tech, Seequa Computer, Corona Data Systems, and Compaq Computer. All four companies have machines with standard detachable pc keyboards that fold up over built-in monitors and disk drives to form a compact, carry-on size package weighing under thirty pounds. All four machines have done away with the need for a separate color and graphics adapter; the built-in screens are monochrome, but you can display graphics on them nonetheless and you can attach RGB monitors if you need color. The four machines all come with MS-

DOS, and, naturally, they all claim to run all existing IBM pc software.

Dynalogic's Hyperion computer, which actually made its debut last spring at the Atlantic City Comdex, has a seven-inch amber screen, two built-in 320K disks, 256K onboard, a serial port and a parallel port, and a built-in modem. The Hyperion, with DOS, Basic, *Multiplan*, a text editor, and terminal software, carries a $4,995 price tag.

Seequa Computer's entrant is called the Chameleon, because it has a built-in Z80A coprocessor and therefore runs most existing CP/M-80 software as well as pc software. The machine, which has no expansion slots of its own but will accommodate a Tecmar expansion chassis, comes with two built-in 320K drives, 128K memory, a nine-inch green screen, a serial port, and a parallel port, and sports an introductory price of $1,995.

The Compaq computer features a nine-inch green screen, a single 320K drive (with companion drive optional), 128K, and a parallel port; price: $2,995. The Compaq will be sold at Sears Business Center Stores, among other outlets, starting this month. Corona's Portable PC computer, scheduled for delivery in April, will have the same feature lineup as the Compaq, with the addition of a serial port, and will retail for $2,395.

On the software side, the hit of the show appeared to be Lotus Development's *1-2-3*, a program that looks a little like *VisiCalc* but does a whole lot more. *1-2-3* does database manipulation, plotting, and rudimentary text editing, as well as spreadsheet modeling—all at greased lightning speeds. Lotus, which was still beta-testing the product in late November, took over a million dollars' worth of contingent advance orders at Comdex.

Context Management Systems, whose *MBA* appears to be the principal competition for *1-2-3*, did not have a booth at the show. At a press conference nearby, however, they unveiled version 2.0 of *MBA*. The changes in the new version are twofold: speed enhancements and telecommunication capability; *MBA* will now take data from remote sources and translate it directly into its spreadsheet format.

A Mouse on the Floor. At the other end of the show floor from Lotus, VisiCorp revealed what it had been up to for the last couple of years. The company's product, *VisiON*, takes a different approach to the integrating of software functionality.

VisiON is not an end-user product, but rather an environment in which application programs of various kinds—yet to be developed—will operate. The net result of this environment is to insulate the user further from the need to understand operating systems and file structures.

If you've ever seen a Xerox Star or a system like it, you'll recognize immediately what *VisiON* is about. If you haven't, it's a little hard to describe.

In *VisiON* you'll move the cursor around, not with the keyboard but with a mechanical, track-ball-like device called a *mouse*. With the mouse you can point to and select any of a row of seven fundamental commands that will remain on the bottom of your screen at all times. You can also use it to pull various kinds of documents out of your electronic file cabinet and lay them on the screen—your electronic desktop.

With the proper application software, you'll be able to have several different kinds of documents cluttering up this desktop at the same time. You might, for example, have a folder full of personnel data in one corner of the screen, while in another corner, perhaps partially overlaying the personnel file, you might have a memo that you've been preparing with a text editor. With the mouse you'll be able to point to information in one document and simply move it into the other.

The outcome of this information transfer may be no different from what you could achieve with programs like *MBA* and *1-2-3*, or, for that matter, with VisiCorp's existing products that read DIF

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files. And, in fact, there are those who contend that the mouse approach, because it calls larger muscle groups into play than does traditional typing, is ergonomically unsound. But *VisiON*, by *visually* relating computing processes to the more familiar world of paper, folders, and file cabinets, may well have a strong appeal, particularly among newcomers to personal computing.

VisiCorp had several application programs running in conjunction with *VisiON* for its demo at Comdex, but finished application software won't be available to the public before summer.

VisiCorp also augmented its line of traditional, file-oriented software with—you guessed it—a word processor, *VisiWord*. The program, in addition to being a general-purpose text editor, appears to be optimized for the manipulation of *VisiCalc* print files; it has, for example, an over-and-under split screen option that allows you to bring a file in from disk, massage it to your satisfaction on the lower half of your screen, and *then* inject it into your main document.

IBM had nothing brand new at this show. The pc corner of their booth ran demonstrations of recently announced software, including *Personal Filing System* and *Multiplan*.

Glowing Plasma. Off in another corner of the booth, however, a pc could be seen driving a spectacular plasma display. Officially called IBM 581, the Plasma Display Subassembly is intended for original equipment manufacturers, rather than for the general pc-loving public (but you could pick one up anyway for $4,500).

Rather than whacking a phosphor-coated screen with electron beams, as your CRT does, the plasma display excites a neon-argon gas mixture at precise and highly resolved locations. The crucial advantage of this approach for the personal—particularly the portable—computing industry, is that the display is essentially a flat panel; IBM 581 is a mere three inches front to back (its other dimensions are much more ample—large enough, in fact, to display the equivalent of four eighty character by twenty-five line screens simultaneously!).

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Around another bend in the IBM booth-maze was a hard disk subsystem (IBM 676)—also intended for OEMs. IBM still doesn't market a hard disk for the pc, but as though to prove they know how to do such things, they had the IBM 676 connected not only to a pc but also to, of all things, an Apple II.

The Apple fortress was situated directly adjacent to IBM. Rumors abound that both these companies will be introducing new computers early in 1983, and that they might both be grappling for a larger share of the inexpensive home-computer market, as well as competing for the business user (IBM will be exhibiting at this month's Consumer Electronics Show in Las Vegas, a fact that's aroused considerable speculation about Big Blue's aspirations in the low-price market). For the time being, the battle was waged with familiar implements, Apple IIs and IIIs going eye-to-eye across the aisle with the IBM pc.

Other notable wares, hard and soft: Software Arts showed *TK!Solver*, although this general-purpose arithmetic tool, at showtime, was still not quite ready for the market. Peachtree Software took off in a new direction, by introducing SPeachware, a speech synthesis system. A company called Votan also displayed a remarkable voice recognition and voice generation system for the pc. Tecmar's long-awaited 68000 coprocessor board turned out to be still among the long-awaited. And VenturCom unveiled what they claimed to be the first true Unix running on the pc.

And speaking of firsts, at a press conference to introduce his *WordVision* "writing tool" program, Jim Edlin of Bruce & James Program Publishers also introduced a gentleman named John Brockman, who is, Edlin believes, the first software agent. Brockman, whose literary agency in New York handles about two hundred writers (mostly serious nonfiction), is now looking to represent programmers as well. Goodbye, cottage industry.

Edlin himself is attempting to stake out some new ground with *WordVision*—and a line of *Vision* products to follow. The products will be sold in bookstores as well as in the standard software emporia; prices will generally be held below the considered-purchase level (*WordVision* will sell for just under fifty dollars). Also, in their own way, Bruce & James are trying, much like VisiCorp at the other end of the price spectrum, to disencumber the user of traditional computerists' concerns. The company's products will replace verbal metaphors with visual ones with the goal of making their software more accessible to new computer users.

Edlin's erstwhile employer, *PC Magazine*, had news of its own at Comdex. That journal has been bought by Ziff-Davis Publishing Company, publishers of *Creative Computing* (among others). Meanwhile, David Bunnell, former publisher of *PC*, will be heading a new IBM-oriented magazine, to be called *PC World*. Bunnell reportedly took all but three members of the *PC* staff with him to start the new venture. *PC World* is owned by CW Communications, publishers of *InfoWorld* and other journals.

Comdex this year also brought with it a typhoon of Japanese personal computers—from Epson, Hitachi, Seiko, Sony, Toshiba, Canon, and NEC. Panasonic was there as well, but only with printers; their 8088-based computer is not yet ready for distribution in this country. While the Japanese machines have some novel design features—including 3-inch disk drives on the Sony and Hitachi machines—from a processing standpoint they are, like most everyone else, aligning themselves around CP/M-80 and MS-DOS.

Next year's Comdex promises to be bigger and better than this year's. By closing time, the Interface Group had already sold 4,600 booth units—nearly 150 percent of the entire 1982 show. The bazaar will be all over town next year—in at least three and probably four or more hotels, as well as the mammoth Convention Center.

Bring your own helicopter. ▲

QUESTIONS & ANSWERS

by Nancy Andrews

Have you ever wondered as you sat in front of your pc whether there was any way in the world you could get a question answered or at least find someone with a similar problem so you could work on a fix together?

Some of you have thought *Softalk* would be a good forum for these questions, and we agree. So each month we plan to publish several questions and answers in this column.

With some of your questions, we may have experienced similar problems, and we may know the answers or be able to get them. With others, we may only be able to confirm that, yes, the problem does exist, and then solicit you, our readers, for your experiences and solutions.

So, readers, this is your column. Send us your questions and answers, and we will do our best to put them together.

Q: I recently purchased the *Basic Compiler* for the IBM pc. I tried to compile some programs that I had been using in interpreted Basic for quite some time, and I ran into a problem.

The problem occurs when I write a file and then read it back in. When the last record is reached, I sometimes get an "input past end" message when a one-character string field is included in a record. I tried writing three small programs that write a file using null strings, one-character strings, and two-character strings. They all work as expected in the interpreter, but the one-character string program always fails in the compiled version.

Samuel M. Kennard IV

A: You have indeed found a bug in the *Basic Compiler.* IBM now has a patch for this problem, and it will be included in all future versions of the compiler. In the meantime, before the next revision of the compiler is released, IBM says it will make the patch available to dealers by way of the Dealer Response Hotline. Users of the present *Basic Compiler* release should, by the time this appears in print, be able to obtain the fix at no charge from their dealers.

Q: I have several questions I'd like you to address: 1. Please mention the pitfalls of mismatching DOSs. 2. I experience poor results if I do not use the /1 when formatting or disk copying (I have two single-sided drives). Apparently this is not an optional command in my situation. Would you comment on this? 3. I would like to know which method of head cleaning you recommend. How about a step-by-step guide to cleaning the pc's head manually? 4. Several companies are selling boards with hookups to a BSR controller. How would this work? Would my computer have to be on twenty-four hours a day? Could this be set up to run a burglar alarm system?

R. L. Selby

A: Here are some answers that may start you in the right direction. 1. Our System Notebook author, Alan Boyd, says he does plan to deal with the pitfalls of mismatching DOS 1.0 and DOS 1.1. So watch his column. 2. The /1 is truly an optional command. In our experience it has always worked that way, and most of us, who would prefer not to type the two extra characters, never use the /1 and still get good results. So, in your case, the fact that you must use /1 may indicate a problem with your disk drives; the machine should be able to tell whether your disk drives are single or double-sided, but in your case it seems unable to do so. 3. To clean the pc's head we recommend one of the several commercially available products (from Verbatim, Lifeboat, Innovative Products—among others). You cannot clean the head manually from the outside. And if you open up your machine while it's still under warranty and something is accidentally damaged, the warranty will no longer be valid. 4. One board we're familiar with is a Tecmar product, the PC-Mate Device Master. It has a battery-powered real-time clock and calendar. It communicates with the popular BSR X-10 remote controller through an ultrasound adapter. There is no direct connection to any electrical outlets, so the operation of this board cannot damage the computer in any way. It is ideally suited to controlling up to sixteen lamps or small appliances on a regular schedule for energy management, for security (lights on and off), or for convenience. You do this by attaching a small unit module to each appliance where it is plugged in. The BSR will then signal these appliances over your wiring and turn them on or off.

The real-time clock is powered by an onboard battery that maintains the correct time/date for approximately five years with the computer turned off. The timer can be used to schedule the BSR device. There is also an alarm that is active with the computer off, so with additional external circuitry and proper programming (not included), this board can be used to turn the computer on, perform certain functions, reschedule, and turn itself off.

Automated Business Machines also has a BSR-X10 interface module. It uses the IBM cassette port, so it doesn't occupy a board slot. The module comes in a box that plugs directly into a wall outlet. Software is provided that can control up to 256 devices, sixteen devices for each of sixteen different house codes. An external clock is needed but not provided.

Currently both the Tecmar BSR board and the ABM control module are output devices, so they couldn't be set to operate a burglar alarm that requires input. You could conceivably build a baseboard with parallel PTL circuits. Then, on a regular basis, you could generate a signal to an auto-dial modem to call the police, for example. But writing the software and interfacing necessary to accomplish this would be a major project.

Q: While attempting to assemble a program with the IBM Personal Computer assembler, I noticed that the symbol *ABS* acted strangely when used as a label. From the sample program, it appears that ABS can be used as a label. However, when you attempt to assign the address of that label to another DW, a value of zero is returned. I looked through the assembler manual to determine if ABS is a reserved word but was unable to find any reference to ABS.

Norman D. McIntosh

A: You analyzed the problem correctly. ABS is, in fact, an undocumented keyword. The IBM/Microsoft assembler is based on the Intel assembler, and ABS is a keyword for Intel. It looks as though IBM/Microsoft may have put in Intel's entire keyword list and then only implemented some of them, leaving behind some artifacts. They are obviously undocumented because they are not implemented in the assembler, but they cannot be used as la-

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bels because they are part of the keyword list. If you find other words that behave this way, you might check Intel's documentation and see if this is true in those situations as well.

We refer you to the *ASM86 Language Reference Manual* or *Introduction to ASM86*, both available from Intel.

Q: Your September issue states that IBM Pascal is limited to 64K for a finished program and that UCSD Pascal generates programs that can use up to 128K. My question is: for Fortran, which system generates the largest program size?

Frank P. Kelly

A: First, there's a misconception regarding the size of programs IBM Pascal can handle. There are two limits—code size and data size. It is true that any one source file is limited to 64K, but you can link as many of these compiled modules as you want. Data is limited to 64K; this includes the total of your main variables, the stack, and the heap. You can get beyond this 64K data limit and get at all the memory in the machine, however, by using the long address type (*ads*) and the *consts* and *vars* parameters.

Now for the question you ask. IBM Fortran code works much like Pascal. An individual source file is limited to 64K, but again you can link several of these together. Data limits are as follows: all variables, blank common blocks, and space for the stack and heap are limited to 64K. Named common blocks can each be up to 64K, and you can have as many as you want.

UCSD Fortran, like UCSD Pascal, has virtual memory management. So you design your program in modules of up to 64K but then compile the program only once (unlike IBM Fortran, where each module must be compiled separately and then linked). Virtual memory management makes program development easier, but programs run more slowly because of the disk reads required for the overlays and because programs are compiled to p-code and then interpreted. UCSD Fortran is easily compatible with UCSD Pascal, and modules of both can be compiled to form one program.

Q: I found a serious error in the Pascal compiler for the IBM Personal Computer. If you multiply a constant that's a power of two, watch out! The following code demonstrates the problem:

```
PROGRAM TESTPAS (INPUT,
OUTPUT);
VAR A,B,C,D : INTEGER
BEGIN
   WHILE TRUE DO
     BEGIN
        WRITE ('ENTER A
        NUMBER:');
        READLN (A);
        B := 4 * A + 2;
        C := 5 * A + 2;
        D := 8 * A + 7;

        (* prints results... *)
     END
  END.
```

This program produces the following results:

```
ENTER A NUMBER: 0
4 * A + 2 = 0
5 * A + 2 = 0
8 * A + 7 = 7

ENTER A NUMBER: 8
4 * A + 2 = 32
5 * A + 2 = 40
8 * A + 7 = 71
```

As this program shows, an error is produced. However, it is not confined to one line of Pascal source code. Later in the program a multiply by another number that's a power of two could conceivably cause errors in the code at an unknown point. I think users of this software should be aware of this problem.

Soloman Katzman

A: You're right, the error is there. What happens is that the compiler does the multiply by the first power of two as a left shift. It does this by loading the CX register with the number of bits to be shifted and uses this as the loop counter. Then, when the loop is exited, CX= 0; however, the compiler forgets this, and when it adds the constant (also a power of two) it thinks that CX still contains this value—and the error occurs.

For now, one way to use IBM Pascal and get correct results with this type of program is to take Debug off when you run your program. You do this by putting (*$debug–*) at the beginning of your file. This turns off all error checking, so you have to be careful about overflow, but because the program now loops differently, the error you describe is eliminated.

IBM is working on a patch for this error. It should be available shortly through the dealer response hotline, which means you should be able to get the patch from your dealer.

Automated Business Machines, 29352 Avocet Lane, South Laguna, CA 92677; (714) 643-0439. Intel, 3200 Lakeside Drive, Santa Clara, CA 95051; (408) 987-5320. Tecmar, 23600 Mercantile Road, Cleveland, OH 44122; (216) 464-7410. ▲

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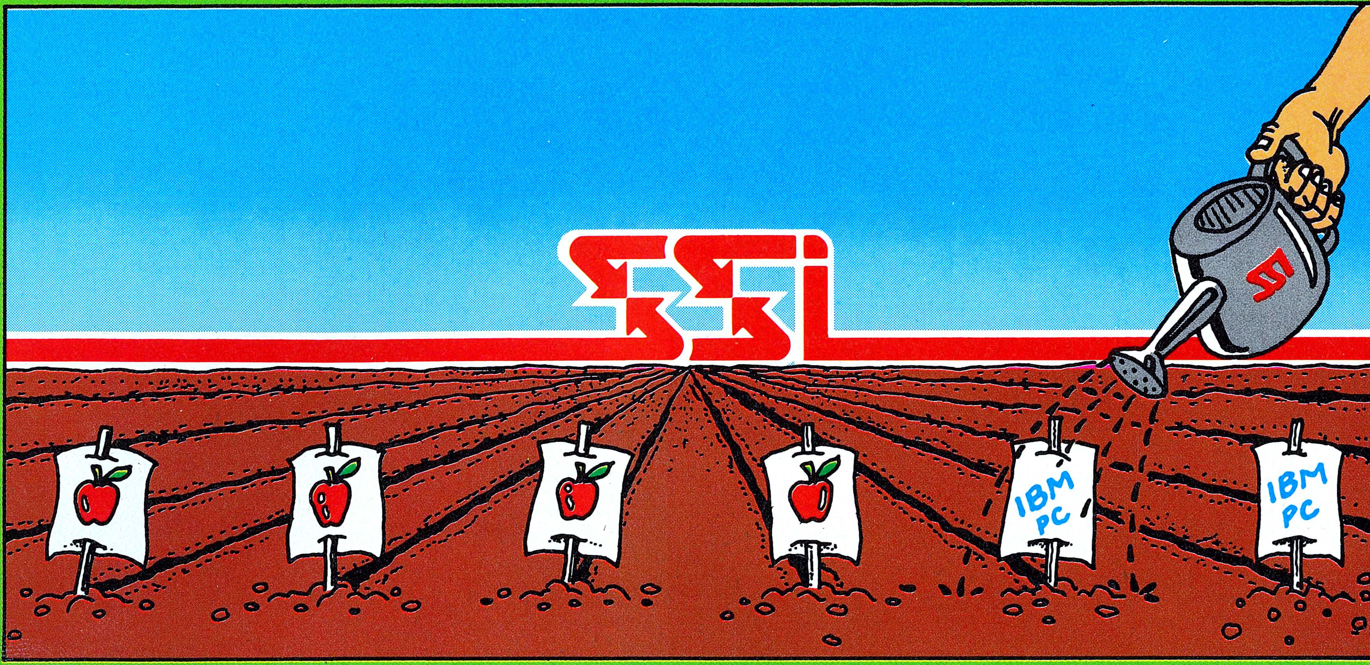

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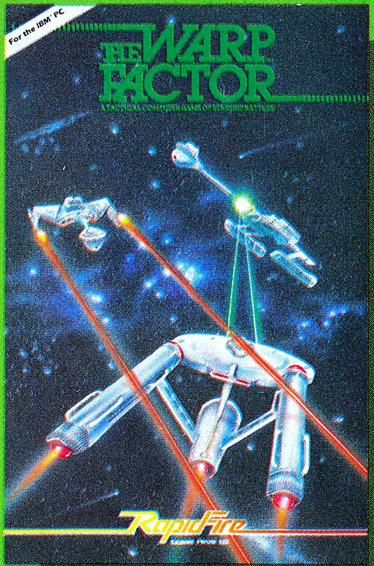

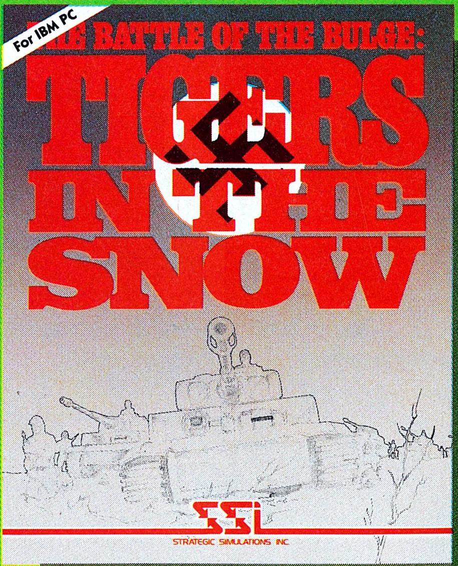

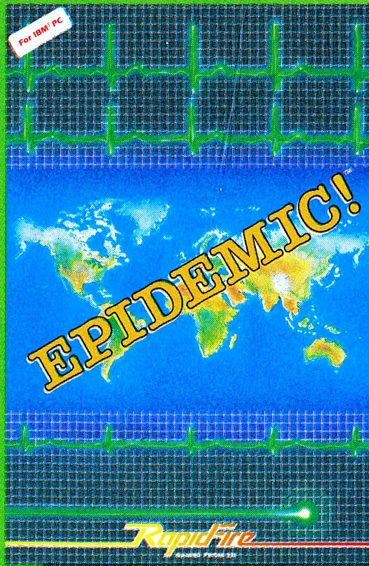

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softalk presents the bestsellers

The IBM pc has been out there for slightly more than a year at this point, and the reactions of the marketplace are starting to raise some uncomfortable questions.

Primary among the imponderables is how to measure the value of the installed user base. Installed user base, of course, is that group near and dear to the hearts of computer manufacturers everywhere, because it historically has represented both success in the market and opportunity. The opportunity comes from selling additional software and peripherals to that installed base and, in the past with other systems, the inside track when the computer owner outgrows his system and decides to upgrade. Thus it is that installed user base is a sacrosanct concept.

The personal computer market has magnified the value of the installed user base—particularly in the eyes of independent companies who make software or peripherals in support of widely sold computers. The evidence is both intuitive and observable. Seldom will you find the owner of a Cray mainframe browsing his local computer store in search of a new database management system or a better word processor. Yet Apple, Atari, and Commodore owners prowl computer stores in search of new products—both useful and entertaining—with an intensity matching that of a programmer pursuing a coding error.

Such owners make it a seller's market for software and peripheral companies. Better mousetraps are more certain of reward in the microcomputer industry than in any other segment of our economy. The roll call of companies that made their fortunes on one such product is a who's who of microcomputerdom: VisiCorp, MicroPro, Microsoft, Digital Research, Corvus, Sorcim, Software Publishing Corporation, and Stoneware.

It's the success of such companies and the demonstrated hunger of the end users for more and better tools for their microcomputers that have inspired the host of other companies that have entered the industry. And when IBM announced the pc, a whole raft of new companies sprang up—determined to be early and viable competitors in what looked like the best new market of the eighties.

The scorecard on the pc market is mixed. Obviously, the machine itself is a huge success. Already it's the second fastest selling microcomputer and bids fair to overtake the Apple II for first place. That fact has been enough to incite any number of new company startups.

The problem is that the pc buyer is not exhibiting the same traits of hunger and voraciousness as his microcomputer compatriots. A substantial minority of pc buyers never darken the door of a computer store after their initial buy. That explains the total dominance of three packages in the IBM market— *VisiCalc*, *WordStar*, and *SuperCalc*.

Spreadsheet calculations and world processing are the two acknowledged uses for microcomputers, and many buyers are loading up with these programs and not buying anything again. This behavior trait by a significant bloc of pc owners is dimming the luster of the market for some independent software suppliers. The secondary market reacts as if it were only 70 percent as strong as the primary market. And the cream is being skimmed by the big three.

But not even the big three can pull their auxiliary products through the market. Special marketing ploys by VisiCorp and MicroPro have enhanced sales of the remainder of their lines, but not to the extent one might suppose from looking at the strength of the flagship product.

MicroPro's *WordStar* captured first place in the pc market in

We think our new mailing list program is the best in the world. And we're not alone.

1st CLASS MAIL. By Bob Schoenburg and Steve Pollack. Here's a pair of authors who may be software's answer to Irving Wallace. Wallace is the bestselling author who hears the murmuring of general populace and caters to their desires. Bob Schoenburg and Steve Pollack seem to have the same trait.

Consider.

The pair brought out *Home Money Minder*, a perfectly respectable home finance package. Then they listened to the user feedback. The result was *Home Accountant*, one of the phenomenal success stories of the first half of 1982.

Around the same time *Home Money Minder* hit, the team also tested the market with *The Mailroom*. Mailroom never was the success of *HMM*, but the authors used the same technique—listen to the users and incorporate all the good ideas. The result is **1st CLASS MAIL**—a program that, incredibly enough, manages to live up to its double-entendre name.

All of the above is not to accuse Schoenburg and Pollack of putting out the programming equivalent of stalking-horses to do their market research for them. Their original efforts do stand on their own merit. They just pale next to the sequels.

1st CLASS MAIL is so well thought out and so easy to use that other publishers who call their programs "user friendly" should bow their heads in shame.

SOFTALK got an early release of the program sans documentation. Yet a rank computer illiterate was able to apply the program to two separate uses with relatively little trouble. This is high praise indeed: that a novice operator could use a powerful program with no more than the screen menus.

The program allows for twelve fields, clearly more than the traditional name and address of a mailing label. The implication is that the software can be put to other innovative uses as well. The built-in ability to sort and filter on any field or combination thereof enhances the chances that users will find multiple applications for the program.

Continental Software will actually be publishing four versions of the program.* The one already in release is for the Apple II using floppy disks. A hard-disk version will follow. Both versions are pending for Apple III as well, awaiting the development of a rapid binary sort subroutine.

1st CLASS MAIL is a first-rate program for specialized data base applications.

Reviewed by Al Tommervik, Publisher, Softalk.

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November, thoroughly outselling *VisiCalc.* VisiCorp's pride suffers from intense competition with Sorcim's *SuperCalc. VisiCalc* appears to be the choice of pc buyers who stay in the market to buy other software, while *SuperCalc* appears to have gained the upper hand with buyers who will not return to the market for more products.

While *WordStar* was capturing first, its companion piece, *MailMerge,* was actually dropping a few ranks. *WordStar's* strength pulled *SpellStar* into the Top Thirty for the first time, however. *VisiCalc's* strength pulled *VisiFile* and *VisiTrend/VisiPlot* along and almost yanked *VisiSchedule* onto the list. Even here, *VisiFile* dropped a few notches.

An update to *Asynchronous Communications Support* breathed new life into that package and propelled it into fourth place. *Home Accountant Plus* maintained fifth, although it tied with *Microsoft Decathlon.*

Moving strongly up through the list was *dBase II,* capturing seventh in November and becoming the bestselling database program. *Crosstalk* and *Macro Assembler* tied for eighth and *FriendlyWare PC Introductory Set* tied with *Basic Compiler* for tenth.

Among word processors, *EasyWriter II* retained second place behind *WordStar.* The surprise here was the resurgence of *EasyWriter 1.1,* which vaulted past *Volkswriter* to third among the genre and tied for sixteenth overall.

Although there was an increased number of entertainment packages in the market in anticipation of a big Christmas season selloff, those sales were not materializing in November. Most entertainment software sales were steady, and no new packages were capturing the fancy of the buyers. ▲

IBM Personal Computer sales outlets representing approximately 5.1 percent of all sales of pc and pc-related products volunteered to participate in the poll.

Respondents were contacted early in December to ascertain their sales for the month of November.

The only criterion for inclusion on the list was the number of units sold—such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

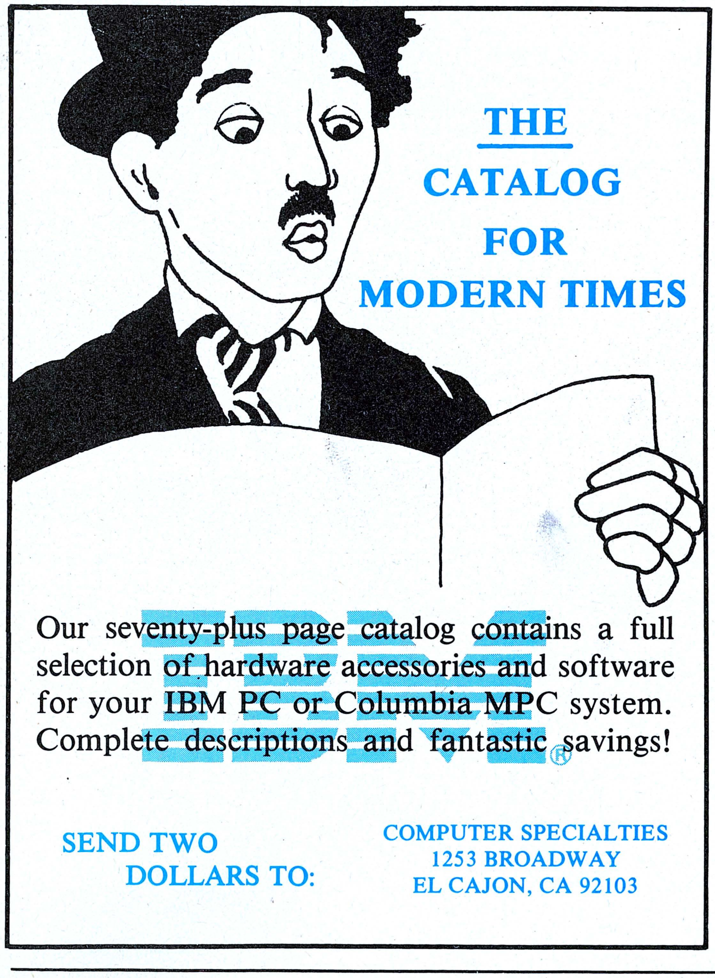
Respondents in December represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only for the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

Probability of statistical error is plus or minus 4.5 percent, which translates roughly into the theoretical possibility of a change of 5.13 points, plus or minus, in any index number.

the top thirty

This Month	Last Month	Index	
1.	2.	161.86	**WordStar;** MicroPro
2.	1.	126.91	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston; VisiCorp, IBM
3.	3.	98.71	**SuperCalc;** Sorcim
4.	6.	49.05	**Asynchronous Communications Support 2.0;** IBM
5.	5.	45.37	**Home Accountant Plus,** Mike Farmer, Bob Schoenburg, Larry Grodin, and Steve Pollack; Continental Software
	14.	45.37	**Microsoft Decathlon,** Microsoft/Tim Smith; IBM
7.	15.	41.08	**dBase II,** Wayne Ratcliff; Ashton-Tate
8.	10.	34.95	**Crosstalk;** Microstuf
	27.	34.95	**Macro Assembler,** Microsoft; IBM
10.	4.	33.11	**FriendlyWare PC Introductory Set,** Michael D. Yaw, James J. Davis, Frank Smith, Alan Vanchura, John Leatherwood, and Bruce W. Moore; FriendlySoft
	16.	33.11	**Basic Compiler,** Microsoft; IBM
12.	12.	31.88	**EasyWriter II,** Basic Software Group; Information Unlimited Software
13.	9.	29.43	**VisiFile,** Creative Computer Applications/Colin Jameson and Ben Herman; VisiCorp
14.	16.	29.43	**VisiTrend/VisiPlot;** VisiCorp
15.	24.	25.14	**MBA;** Context Management Systems
16.	8.	23.91	**General Accounting,** John Moss and Ken Debower; IBM (BPI)
		23.91	**EasyWriter 1.1,** John Draper; Information Unlimited Software
18.	11.	21.46	**MailMerge,** MicroPro
	18.	21.46	**General Ledger;** IBM (Peachtree Software)
20.	13.	19.01	**Zork I;** Infocom
21.	26.	18.39	**IBM Pascal,** Microsoft; IBM
22.	—	15.94	**IBM Fortran,** Microsoft; IBM
23.	19.	14.71	**Microsoft Adventure,** Gordon Letwin (Will Crowther and Don Woods); IBM (Microsoft)
24.	29.	14.10	**Accounts Receivable;** IBM (Peachtree Software)
25.	22.	12.88	**Space Strike,** Mike Abrash; DataMost
	—	12.88	**SpellStar;** MicroPro
27.	25.	12.26	**Zork II;** Infocom
28.	7.	11.04	**Total Information Management;** Innovative Software
29.	20.	10.42	**Deadline;** Infocom
	29.	10.42	**Temple of Apshai,** Jeff Johnson, John Freeman, and J. W. Connelly; Epyx/Automated Simulations
	—	10.42	**Zork III;** Infocom



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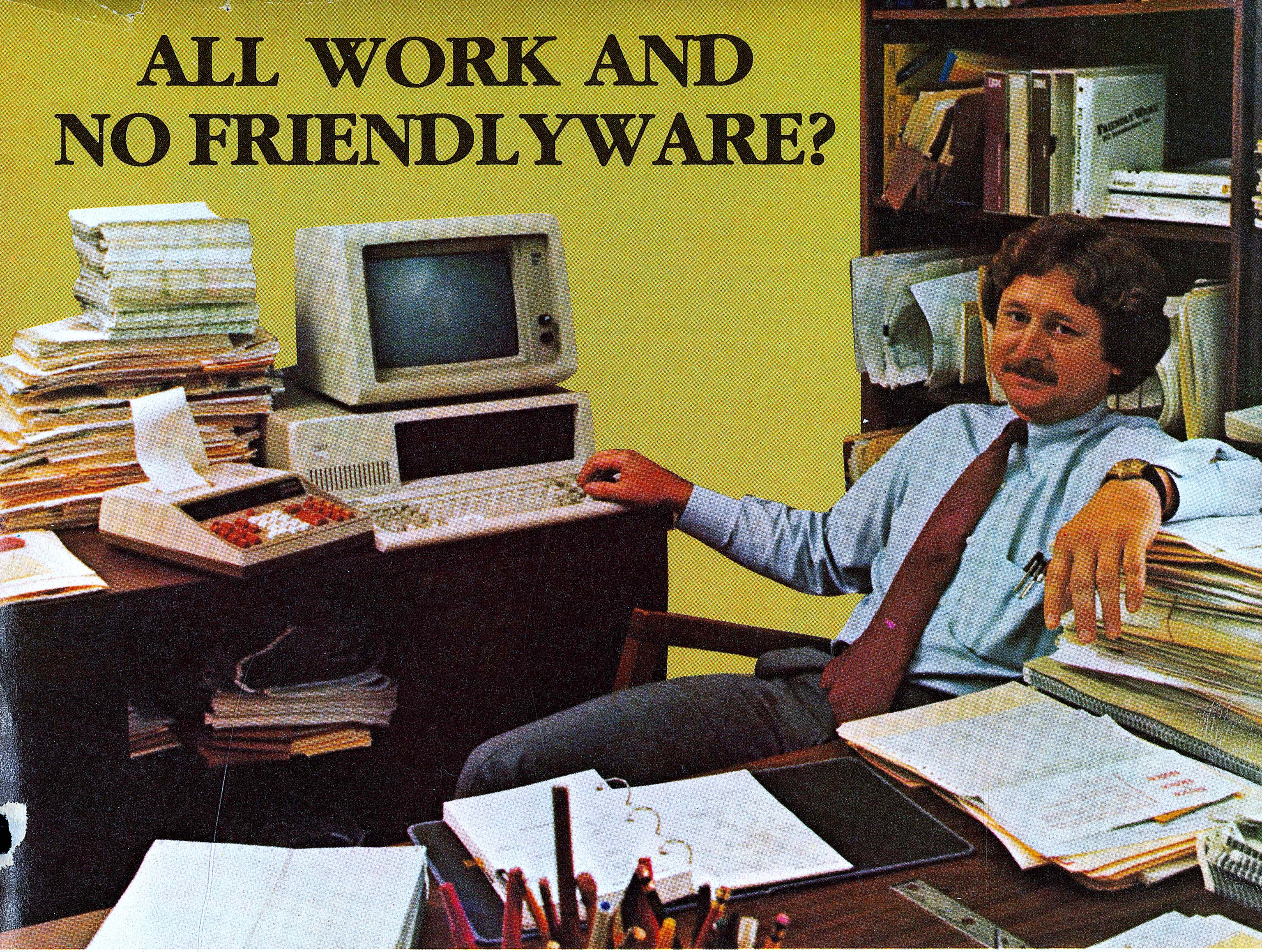

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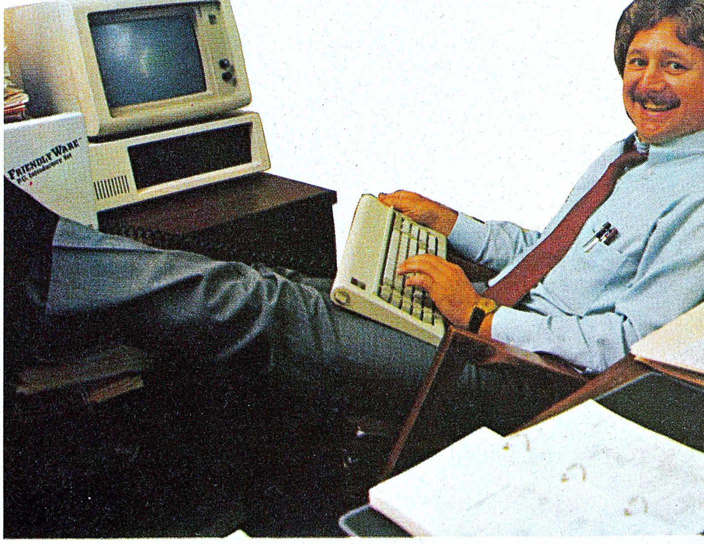

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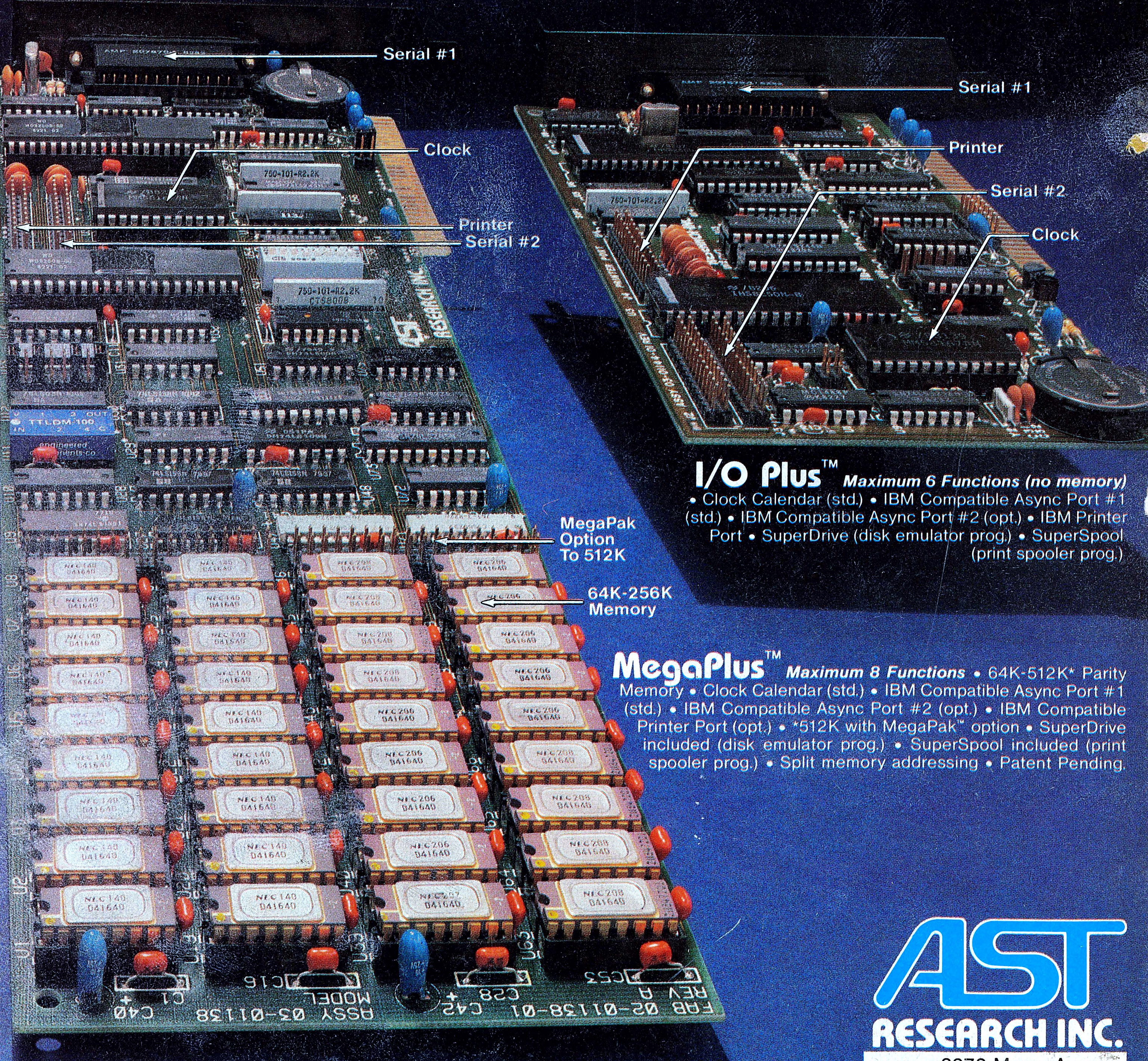

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